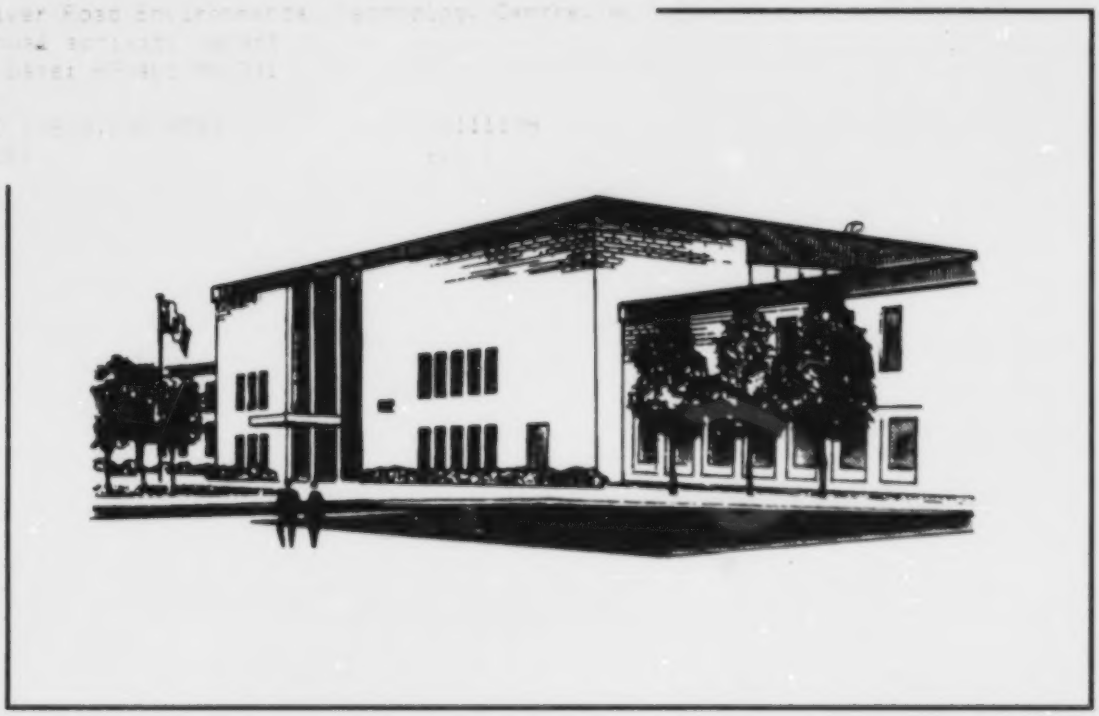
River Road Environmental Technology Centre



Annual Activity Report
April 1, 1989 to March 31, 1990

Environment Canada
Conservation and Protection
Technology Development Branch

River Road Environmental Technology Centre

Annual Activity Report
April 1989 - March 1990

Conservation & Protection
Technology Development Branch
River Road Environmental Technology Centre
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Report 90-10

92-01792/

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Introduction...

The River Road Environmental Technology Centre (RRETC) is located in Gloucester, Ontario, close to the Ottawa International Airport. The RRETC is one of two technology centres operated by Conservation and Protection, Environment Canada, in support of the federal mission to protect the environment. RRETC deals primarily with technologies to measure air pollutants and to respond to spills of hazardous materials. The sister Wastewater Technology Centre in Burlington, Ontario, deals with technologies to control water pollution and residues. A significant proportion of the technology work is contracted to the private sector.

The activities of the RRETC are summarized on a yearly basis in the Annual Report series. Project results are documented in informal (unedited) reports, and a formal Environment Canada (edited) report series available in both official languages. In addition, staff contribute technical papers to proceedings of conferences and workshops. A summary of reports and papers from the Centre in 1989/90 is included in *Appendix A.*

Also, a listing of staff members is included in *Appendix B.*

ACKNOWLEDGEMENT

Janet Fewster co-ordinated the preparation of this report.

Director's Office (DO)

The DO is responsible for the provision of general direction to the RRETC programs and for provision of central services such as administrative support, instrument and equipment maintenance/modification services, and computing assistance. In addition, co-ordination of special issues is undertaken on occasion.

DO Highlights

1. The development of eleven discussion papers was co-ordinated as part of the Preparedness/Response component of the Marine Spills Interdepartmental Review. These papers and related briefings were provided to the Public Review Panel on Tanker Safety and Marine Spills Response Capability which was announced by the Prime Minister in June 1989.

2. Three acute lethality testing methodologies were completed for use in relation to the Fisheries Act and CEPA; two Reference Methods were prepared, based on two of the methodologies, for citation in the new Pulp and Paper Regulations under the Fisheries Act.

3. The five-year plan to meet the biological testing requirements of C&P was updated and disseminated.

Chemistry Division (CD)

The Division has a capability to analyze for a variety of organic and inorganic compounds in diverse sample matrices which usually originate from air pollution-related sources. Analytical method development work is also undertaken to ensure the most appropriate procedures are used for specific sample types and to support the development of environmental regulations.

The Organic Laboratory measures ultra trace (ppt, ppq) levels of many organic compounds with particular emphasis on the analysis of chlorinated dibenzo-p-dioxins (PCDD), chlorinated dibenzofurans (PCDF), polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons (PAH) and priority pollutants. A specially designed and operated High Hazard laboratory is used for the analysis of these extremely toxic chemicals. The laboratory carries out major analytical projects in support of national programs like the National Incinerator Testing and Evaluation Program (NITEP); designs and implements interlaboratory studies to validate procedures; and manages QA/QC and method development programs to ensure data generated by contract labs for ultra-trace levels (ppt, ppq) of these organic compounds in complex sample matrices are of the highest quality.

The Inorganic Laboratory measures a number of common anions associated with acid rain including sulphates, nitrates, fluoride, bromide and phosphates.

Additionally, a multi-element analytical capability exists for toxic metals such as arsenic, lead and mercury.

A Quality Assurance/Quality Control (QA/QC) Section undertakes QA/QC activities in support of activities of the Federal Provincial Advisory Committee on Air Quality (FPACAQ).

CD Highlights

1. In support of the NITEP/US EPA Mid-Conneticut Municipal Solid Waste (MSW) Incinerator test program, analyses of PCDD/PCDF, PCB, CB, CP and PAH were completed on 71 proof rinses, 63 stack emissions, 50 process ashes, 15 leachates and 13 external QA/QC samples. Of 212 samples, 42 selected samples were analyzed for the 17 2,3,7,8-substituted congeners as well as congener groups of PCDD/F using Hi-Res Mass Spectrometry (MS) at 10,000 resolution. Analytical performance on two batches of audit samples submitted by US EPA were satisfactory. A report describing the analytical procedures used for this program has been prepared and included in Volume III of the NITEP report.

2. New stations at Hamilton, Junction Triangle, Montreal and Arvida were included for PAH monitoring since January 1989. A total of 45 samples were analyzed for PAH.

3. Analyses of 26 QA split samples including pulps, sludges and effluents from various pulp mills for PCDD/F using Hi-Res MS were completed. As a member of the Dioxin QA Committee, QA and raw MS data of more than 200 sample analyses submitted by the contract lab were carefully audited, and comments and recommendations were provided.

4. Participated in a PCDD/F ambient air interlab study sponsored jointly by Ontario MOE and RRETC as part of a CCME project to develop ambient air measurement methods. The study was completed and a paper was posted at the *Dioxin 89* conference.

5. In response to the Contaminated-Fuel crisis, a total of 160 fuel and chemical waste samples were analyzed for PCB and chlorobenzenes during May and June.

6. Because of the accidental emission of smoke and particulates from the Goose Bay PCB Destruction Unit, 7 swab, soil and water samples were analyzed for PCB and PCDD/F.

7. In response to the Hagersville tire fire, a total of 50 pairs of Polyurethane Foam Filters (PUFs) and glass cartridges were cleaned and prepared for sampling.

8. Dichot filters from the Windsor/Walpole ambient air studies were analyzed on a regular basis. Over 60 multi-element and anion analyses were reported to Ontario Region.

9. A number of gasoline samples from retail outlets were analyzed for Ontario Region. Numerous discussions with O.R. officers and legal advisors were held in regards to a possible prosecution. The matter remains outstanding but several re-analyses of the samples were carried out using both the "official" 1973 Reference Method and the current methods.

10. A complete overhaul and reconstruction of the High Hazard lab facility was planned and the design and implementation process begun with DPW. Consultant studies and pre-construction design plans were completed and construction will begin in FY 90/91, pending the availability of funds. Estimated costs for this major facility up-grading project are $800K.

Environmental Emergencies Technology Division (EETD)

The EETD is a national focal point and the Department's centre for technical expertise on the properties, behaviour, effects and remedial measures for spills of hazardous materials. The Division manages the Arctic and Marine Oilspill Program (AMOP) to develop and demonstrate countermeasures for cold-climate oil spills. Program updates are provided at the international annual AMOP seminar.

The Chemical Hazards Emergency Countermeasures (CHEC) Program addresses needs for technical information packages for operational personnel, hazard-level monitoring at spill scenes, and the technology for chemical spill cleanup and prevention. Program updates are provided at the annual Technical Seminar on Chemical Spills.

In addition to seminar proceedings and project reports, the Division publishes a quarterly Spill Technology Newsletter (STNL).

EETD Highlights

1. In response to a request for assistance from EP Ontario, on-site hazard-level monitoring assistance was provided at the Hagersville Tire Fire.

2. The 12th AMOP annual seminar was convened in Calgary on June 6-8 and the 6th CHEC annual seminar on June 5-6. This was the first time both seminars were held together and it was well received.

3. The US Minerals Management Service (USMMS) contributed a total of $172,000 (US) towards eight joint projects with EETD, and the American Petroleum Institute committed to provide additional funding for some of the projects.

4. M. Fingas was a keynote speakers at a workshop convened by the U.S. MMS in Virginia to determine research needs for oil spill response and summarize progress to date.

5. M. Fingas attended the ASTM F-20 Committee meeting in Clearwater 10-12 October and in Phoenix 20-22 February.

6. Aerial remote sensing services were provided and M. Fingas accompanied the airplane to the Komarg spill near St. John, New Brunswick.

7. M. Fingas advised Exxon and the US National Oceanic and Atmospheric Administration (NOAA) on the properties and behaviour of Prudhoe Bay crude oil following the Exxon VALDEZ spill in Alaskan waters, and G. Sergy and M. Fingas provided on-site scientific support at the request of Exxon. Additional advice was provided throughout the summer.

8. A new methodology for shoreline clean-up effectiveness was developed and data used extensively by EXXON VALDEZ spill workers. Results of these evaluations were presented, on request, to a workshop in Alaska in November and in Washington in December, 1989.

9. Merv Fingas was asked to participate in the U.S. Congress review of oil spill preparedness. The involvement included 2 meetings in Washington where presentations were made.

10. Merv Fingas presented a review of oil-spill dispersant use and performance upon request to an assembly of U.S. government and industry senior officials in Washington in December.

11. Merv Fingas attended a CCMS/NATO meeting in Brest, France, September 1989. Three presentations were given; one on Spill Modelling, one on Analytical Techniques, and one on Spill-Treating Agents. Merv was elected to chair the committee on Analytical and Remote Sensing Technology.

12. Harry Whittaker was seconded to the Public Review Panel on Tanker Safety and Marine Spills Response Capability full-time from July 1, 1989 to February 28, 1990, and part-time in March 1990.

13. Harry Whittaker was elected chairman of the ASTM Committee F-20 on Hazardous Substances and Oil Spill Response. He chaired the February 20-23, 1990 meeting in Scottsdale, Arizona.

14. Harry Whittaker served as chairman for the Environmental and Waste Separations Session at the Second International Conference on Separations Science and Technology at Hamilton, Ontario on October 1-4, 1989. Lisa Keller and Monique Punt presented papers at that conference.

15. The micro-filtration and small reverse osmosis units were used in a joint test, with Pluritec Inc. and Seprotech Inc., for Environment Quebec. The aqueous effluent from Pig wastes was successfully treated in a 2 week trial.

16. A joint 3-week test on behalf of the Atlantic Regional Office and New Brunswick Environment was carried out in November 1989. Micro-filtration, nano-filtration, reverse osmosis and enhanced oxidation were successfully demonstrated on a several waste and spill streams.

17. Lisa Keller attended a demonstration of German Oil Spill Containment and recovery technology at Wilhelmshaven and Hamburg, FRG in December 1989. This visit was at the request of the Public Review Panel on Tanker Safety and Marine Spills Response Capability.

18. Several trials were carried out with EETD's mobile UV Enhanced Oxidation Rayox Unit. The first was a demonstration of the unit's ability to destroy 1,4 Dioxane in concentration of approximately 100 ppm. The second trial occurred in Freehold, New Jersey where seven commonly used VOC's were reduced from low ppm levels in water down to concentrations below 5 ppb. The third trial occurred at a Naval Base in Maryland. Several explosive compounds at concentrations up to 1000 ppm were successfully reduced with this Enhanced Oxidation Unit. Several bench-scale trials using the Rayox Unit have also been carried out over the past year.

Pollution Measurement Division (PMD)

The PMD is responsible for co-ordination of the operations of the National Air Pollution Surveillance (NAPS) Network consisting of 380 air monitoring instruments at 130 sampling stations located in 52 major urban areas in Canada.

The Division also evaluates and develops new ambient air pollution measurement technology to support to NAPS network and priority issues such as LRTAP and Toxics.

Source monitoring activities include: development and update of Reference Methods for measurement of emissions from stationary industrial sources in support of CEPA Regulations and Guidelines; development of new emissions measurement methods in response to emerging priority issues; evaluation of commercially available monitors to measure stack emissions on a real-time basis; application of emissions measurement methods at source to satisfy the Department's need for information for a variety of purposes; and bench-scale research on incineration of hazardous wastes.

PMD Highlights

1. The third NAPS Technical Manager's Meeting was organized in Vancouver with participation of various members of the Ambient Section. A summary report was prepared and distributed to participants.

2. The NAPS display was completely redesigned and rebuilt and exhibited at the GLOBE90 international exhibition. Current station data were loaded in files for display of up-to-date network data. Slides on pollution trends were prepared for the exhibition.

3. Since December 1989, a contractor has been working on the NAPS M204 data base; all historical data from 1974 to present has been uploaded; data loading and validation programs have been developed; the record format of the data base has been improved; work will continue into next fiscal year.

4. Support was given to Environmental Emergencies Technology Division (EETD) to assess the impact of the Hagersville tire fire. Two PAH samplers were assembled and calibrated for the survey. PMD staff were on site during the fire to operate the samplers.

5. In support of the C&P Ontario Region monitoring program for the Detroit incinerator, two monitoring stations are being operated in the Windsor area. These sites are measuring dioxins, furans, polycyclic aromatic hydrocarbons, PCB, chlorophenols, chlorobenzenes, volatile organic compounds, inhalable particulates and metallic elements. A data report was prepared which included all results for July 1987 to September 1988 and released in April 1990. A second report covering the period September 1988 to October 1989 is in final preparation.

6. Ambient sampling for PAH is being carried out in four cities - Montreal, Jonquiere, Toronto and Hamilton in addition to the two Windsor area sites. Initial data summary reports were prepared.

7. There was extensive involvement in the development of the NO_x/VOC Management Plan for Canada and in the public consultation process supporting the plan. Activities included presentation at public information sessions, participation in multi-stakeholder workshops, participation in technical group workshops, extensive data analysis re O_3, NO_x and VOC levels in Canada, reviewing technical comments submitted on drafts of the plan and writing a number of the sections of the plan.

8. An Economic Commission for Europe (ECE) negotiating session on the development of an international VOC protocol was attended in Geneva.

9. The third-year work program for the Canadian Council of Ministers of the Environment (CCME) sponsored co-operative R&D project on ambient dioxin sampling and analysis was approved by the CCME parent committee. Activities included an inter-lab comparison involving six Canadian laboratories and a workshop hosted in Toronto which attracted 100 participants. Results of the work program were presented at the Dioxin '89 conference.

10. PMD chaired a joint federal/provincial/industry technical working group to address the industry's request to modify an existing asbestos Reference Method (RM). Meetings were held to establish the mandate of the working group, to identify issues, to understand the position of each party, and to negotiate and agree on a plan of action. Resources requirements were established and technical and financial responsibilities assigned. PMD provided the working group with a study proposal. Field testing is to start in mid 1990. The outcome of the study will determine whether the proposed screening method is acceptable and can be incorporated into the CEPA regulations and whether the existing emission limit has to be adjusted to reflect any major changes to measurement methodologies.

11. A presentation was made at the Secondary Lead Smelter Regulation Workshop to transfer source measurement technology to CEPA inspectors responsible for the compliance and enforcement of emission regulations. The inspectors were trained on the basics of sampling and on-site witnessing.

12. Contribution of PMD to the PCB Incineration Project at Goose Bay included:

    (a) *Project Planning.* PMD discussed the various aspects of an emission compliance testing program with officials from the Newfoundland District Office (NDO), the Waste Management Branch, the province, DND, and the general contractor, Proctor & Redfern. Technical advice on sampling, QA/QC protocols, priorities of process and emission parameters to be tested, cost estimates and other compliance testing concerns were provided.

    (b) *Auditing, QA/QC and On-site Witnessing.* A Source Sampling Audit Plan was written and provided to the project participants. Clean Air Engineering's compliance testing plan was reviewed and comments forwarded to the NDO CEPA inspector. Actual field auditing and witnessing were conducted at Goose Bay in January 1990. The test data were evaluated and the findings reported.

    (c) *Environment Canada Tests.* PMD provided the project participants with a Verification Plan and conducted a

series of emission tests on the mobile incinerator. The emission samples were analyzed for particulates, PCBs, dioxins, furans, and HCl.

13. PMD contributed the following to IPB's Federal Industrial Boiler Emission Control (FIBEC) Program:

    (a) *Promulgation of CEPA Regulations.* The proposed regulation was reviewed and comments were forwarded to IPB. PMD evaluated the performance of a portable gas analyzer and, based on the field experience, proceeded to develop a new Reference Method to be incorporated into the proposed CEPA regulation. PMD also participated in the FIBEC Task Force and provided technical advice to IPB and other members of the FIBEC Task Force on matters related to source emission measurement.

    (b) *AES Study.* PMD participated in a joint field testing survey with the private sector to evaluate the performance of a flue gas recirculation unit designed to reduce NO_x emissions. Continuous monitoring of NO_x, SO_2, CO, CO_2, O_2, THCs, moisture, temperature and velocity in the flues were conducted on the baseline and the retrofit boilers under 36 test conditions with various fuels. Test results were forwarded to IPB and ORTECH.

    (c) *NCR Federal Boilers Survey.* Twenty-four PWC-operated boilers in the Ottawa area were tested for NOx, SO2, and CO emissions. The data base generated was used by IPB to assess the emission levels of existing federal boilers under various process operating conditions. Test results were forwarded to IPB and ORTECH.

    (d) *CFB Halifax.* PMD visited the site and assisted the consultant to implement the testing survey.

14. Contributions of PMD to the Multi-Party Mobile PCB Incinerator Demonstration Project (Vesta at Swan Hills) included:

    (a) *Overall Project Planning.* PMD continued to provide technical advice to the other members of the Technical Committee during the planning and design stage of the project. Meetings were held with representatives from EC, Ontario MOE, Quebec MOE, Hydro Quebec, Ontario Hydro, Chem-Securities, Western Research, Concord Scientific and Vesta.

    (b) *QA/QC and On-site Witnessing.* On behalf of the regulatory agencies and the hydro companies, PMD assumed responsibilities of Scientific Authority of the External QA contract. Much time was spent in negotiating with the various participants to establish

and agree on testing requirements and protocols. An accord was finally struck and a testing plan was published and distributed. A PMD staff member was on-site during Phase I of the emission testing program. However, testing was suspended after an accidental spill at the incinerator site. Project activities will resume early in FY 90/91.

Vehicle Emissions Testing Laboratory (VETL)

The VETL conducts the vehicle emissions testing for the federal government's compliance audit program for new light duty vehicles offered for sale in Canada. This joint Transport Canada / Environment Canada program evaluates new vehicles for exhaust / evaporative and particulate mass emissions to determine compliance with standards and regulations under the Canadian Motor Vehicle Safety Act.

The VETL investigates alternative fuels and alternative engine technologies to determine the potential impact on Canadian air quality and provide emission factors for predicting total national emissions.

The VETL undertakes joint government/industry programs to develop new technologies or optimize existing equipment which will result in performance improvements, and energy and emission reduction.

The facility conducts testing programs to update the Canadian fleet emissions estimates, including in-use vehicle monitoring, effects of ambient temperature conditions, and tampering effects. As a result of testing of this nature, the government develops regulations and guidelines to more effectively protect the Canadian environment.

The VETL provides a unique technical advice and assistance program which includes limited testing for industry. The program includes evaluation of fuel-saving devices and the provision of assistance to the general public, governments, industries, and institutions.

VETL Highlights

1. VETL commissioned a heavy duty vehicle test cell for evaluating urban transit buses and transport trucks. The facility has the capability of undertaking ambient temperature testing and has the instrumentation for conducting a characterization of the vehicle exhaust.

2. The VETL implemented an organic analysis laboratory as an expansion of the dilution tunnel room for sampling / analyzing organic compounds at the dilution tunnel.

3. The VETL participated in three successful industry vehicle cross correlation test programs during this period. The co-

ordinating groups were the North American Motor Vehicle Manufacturers Association and the Japanese Automotive Manufacturers Association.

4. The VETL developed a technique for measurement of hydrogen emissions from electric vehicles. This procedure was implemented for a testing program with Universe Engineering (Magna International) on the G-van, a prototype vehicle for commercialization.

5. A characterization of the exhaust from a Ford flexible fuel vehicle was conducted to determine the emissions from the vehicle as the methanol content was increased from 0% to 85%.

6. An evaluation was undertaken on a 1990 Chevrolet Lumina converted to operate on natural gas using a dual-fuel system. A second phase of the testing is scheduled for FY 90/91 when a GFI system (gaseous fuel injection) has been installed on the vehicle.

7. A series of testing projects were conducted with the PGA (Propane Gas Association) to optimize the fuel metering system for reduction in emissions and energy use, to evaluate the emissions in cold weather and to characterize the exhaust.

8. The VETL conducted emissions tests for Concordia University, the only Canadian entry in the 1989 GM Methanol Marathon. The emission levels were a factor in the determination of the winner of the methanol vehicle rally, in which Concordia placed second in a group of fifteen.

9. The facility initiated an evaluation of the characterization of the exhaust from diesel engine urban transit buses. This represents a baseline for the future evaluation of alternatively fuelled buses.

10. The VETL extension was completed and commissioned in July 1989. The extension provides the facility with an explosion-proof fuel exchange area and a development cell for government / industry programs.

11. The VETL completed testing on two cold weather projects for TSD / IPB. The first was an evaluation of emissions from state-of-the-art vehicle technologies in ambient conditions, and the second was an evaluation of emissions from a blend of 10% ethanol and a blend of 11% MTBE under cold testing temperatures.

12. The VETL completed the 1989 model year compliance program (64 vehicles) and initiated the testing on the 1990 model year program (45 vehicles).

Centre de technologie environnementale de River Road

Rapport des activités annuelles
Avril 1989 - mars 1990

Conservation et Protection
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Rapport no 90-10

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Introduction

Le Centre de technologie environnementale de River Road (CTERR) se trouve à Gloucester, en Iode, près de l'aéroport international d'Ottawa. Le CTERR est l'un des deux centres de technologie que dirige le service de Conservation et Protection d'Environnement Canada pour concourir à la réalisation de la mission du gouvernement fédéral en matière de protection de l'environnement. Le travail du CTERR touche essentiellement la technologie de la mesure de la pollution atmosphérique et les interventions en cas de déversement accidentel de substances dangereuses. Son complément, le Centre technique des eaux usées de Burlington, en Iode, s'occupe de la technologie de la lutte contre la pollution des eaux et de l'élimination des rejets. Une grande partie du travail technologique est confiée à l'entreprise privée.

Les activités réalisées au CTERR chaque année sont résumées dans les rapports annuels. Les résultats des projets sont présentés dans des rapports officieux (non publiés) ainsi que dans des rapports officiels d'Environnement Canada (publiés) qui paraissent dans les deux langues officielles. En outre, le personnel du Centre présente des communications techniques à différents congrès et ateliers. On trouvera à l'Annexe A le résumé des rapports et des communications produits au Centre en 1989-1990.

La liste des employés du Centre est présentée à l'Annexe B.

REMERCIEMENTS

Nous aimerions souligner ici le travail de Mme Janet Fewster, qui a coordonné la préparation de ce rapport.

Direction

La direction veille à l'orientation générale des programmes du CTERR et assure des services communs comme le soutien administratif, l'entretien et la modification des instruments et de l'équipement et l'appoint en informatique. En outre, elle coordonne parfois certains dossiers spéciaux.

Faits saillants

1. La direction a coordonné la préparation de onze exposés de fond sur le degré de préparation et les mesures d'intervention pour l'étude interministrielle des déversements en milieu marin. Ces exposés, de même que les notes explicatives les complétant, ont été présentés au Comité d'examen public des systèmes de sécurité des navires-citernes et de la capacité d'intervention en cas de déversement en milieu marin dont le premier ministre a annoncé la création en juin 1989.

2. On a mis au point trois méthodes d'évaluation de la létalité aiguë dont l'application concerne la Loi sur les pêcheries et la LCPE; à partir de deux d'entre elles, on a élaboré deux méthodes de référence qui figureront dans le nouveau règlement sur les pâtes et papiers de la Loi sur les pêcheries.

3. On a révisé et diffusé le plan quinquennal arrêté en vue de remplir les exigences de C et P concernant l'analyse de produits biologiques.

Division de la chimie (DC)

La Division de la chimie est en mesure d'analyser divers composés organiques et inorganiques présents dans différentes matrices de prélèvement, qui proviennent habituellement de sources de pollution atmosphérique. Elle fait aussi un travail de mise au point afin que les méthodes d'analyse soient le mieux approprié possible aux types d'échantillons à traiter qu'elles soient utiles dans l'élaboration de la réglementation touchant l'environnement.

Au Laboratoire de chimie organique, on dose un bon nombre de composés organiques présents à l'état d'ultra-traces (10^{-12}, 10^{-15}) et plus particulièrement les dibenzo-p-dioxines chlorées (PCDD), dibenzofuranes chlorés (PCDF), biphényles polychlorés (BPC), hydrocarbures aromatiques polycycliques (HAP) et polluants prioritaires. On dispose d'un laboratoire de haute sécurité spécialement aménagé et organisé pour l'analyse de ces produits chimiques extrêmement toxiques. Le Laboratoire de chimie organique mène d'importants projets d'analyse dans le cadre de programmes nationaux comme le Programme national d'examen et d'évaluation des incinérateurs (PEENI), il prépare et réalise des études interlaboratoires en vue de valider des méthodes et enfin, il gère les programmes

d'AQ/CQ et de développement de méthodes, veillant ainsi à que les résultats soient de la meilleure qualité possible lorsque des laboratoires contractuels font l'analyse d'ultra-traces (10^{-12}, 10^{-15}) de composés organiques dans des échantillons de nature complexe.

Le Laboratoire de chimie inorganique analyse un certain nombre d'anions communs associés aux pluies acides tels que sulfates, nitrates, fluorure, bromure et phosphates.

Le Laboratoire comporte en outre des installations d'analyse d'éléments multiples qui servent pour des métaux toxiques comme l'arsenic, le plomb et le mercure.

La Section du contrôle de la qualité fournit des services dans le cadre des activités du Comité consultatif fédéral-provincial de la qualité de l'air (CCFPQA).

Faits saillants

1. Dans le cadre du programme d'essai de l'incinérateur de déchets solides municipaux du Mid-Connecticut du PEENI/EPA, on a dosé les PCDD/PCDF, BPC, CB, CP et HAP de 71 échantillons d'essai, 63 échantillons d'effluents gazeux, 50 échantillons de cendres industrielles, 15 échantillons d'eaux de lessivage et 13 échantillons d'AQ/CQ extérieure. Sur ces 212 échantillons, on en a sélectionné 42 pour l'analyse des 17 congénères substitués en 2,3,7,8 et des groupes de congénères de PCDD/PCDF par spectrométrie de masse (SM) à un facteur de résolution de 10 000. Le rendement analytique de deux lots d'échantillons de contrôle de l'EPA s'est révélé satisfaisant. Les méthodes d'analyse employées pour ce programme sont décrites dans un rapport figurant dans le volume III du rapport du PEENI.

2. Depuis janvier 1989, de nouvelles stations ont été intégrées au réseau de surveillance des HAP, soit celles de Hamilton, Junction Triangle, Montréal et Arvida. En tout, on a analysé 45 échantillons à la recherche de HAP.

3. On a dosé les PCDD/PCDF par SM à haute résolution de 26 échantillons d'AQ fractionnés, dont des échantillons de pâtes, de boues et d'effluents provenant de diverses usines de pâtes et papiers. Par ailleurs, en tant que membre du Comité d'AQ de l'analyse des dioxines, le laboratoire a fait la vérification approfondie des données d'AQ et des données de SM brutes recueillies sur plus de 200 échantillons par le laboratoire contractuel et formulé des commentaires et des recommandations en conséquence.

4. Le Laboratoire a participé une étude interlaboratoire sur les PCDD/PCDF présents dans l'air parrainée conjointement par le ME de l'Iode et le CTERR dans le cadre d'un projet du CCME visant à mettre au point des méthodes de mesure applicables à l'évaluation de la qualité de l'air. L'étude est terminée et a fait l'objet d'une communication à la conférence Dioxine 89.

5. À la suite de la crise suscitée par la contamination du carburant, on a dosé les BPC et les chlorobenzènes d'un total de 160 échantillons de carburant et de déchets chimiques aux mois de mai et juin.

6. En raison du rejet accidentel de fumée et de particules de l'unité de destruction de BPC de Goose Bay, on a dosé les BPC et PCDD/PCDF de 7 échantillons de dépôts, de terre et d'eau.

7. À la suite de l'incendie du dépôt de pneus de Hagersville, on a nettoyé et préparé pour le prélèvement 50 paires de filtres en mousse de polyuréthane et de cartouches de verre.

8. On a régulièrement analysé des filtres Dichot pour les études sur la qualité de l'air dans les bâtiments de Windsor/Walpole. On a signalé la présence de plus de 60 éléments multiples et anions pour la région de l'Iode.

9. On a analysé un certain nombre d'échantillons d'essence provenant de détaillants de la région de l'Iode. La question d'éventuelles poursuites a été discutée à plusieurs reprises avec des représentants et des conseillers juridiques de la région de l'Iode. Rien n'a été décidé, mais on a repris l'analyse de plusieurs échantillons avec la méthode de référence "officielle" de 1973 et avec les méthodes actuelles.

10. On a planifié le réaménagement et la reconstruction au complet du laboratoire de haute sécurité et entrepris avec TP la conceptualisation et la mise en oeuvre. Les études des experts-conseils et la préparation des travaux est achevée; les travaux commenceront durant l'année financière 1990-1991 si les fonds nécessaires sont disponibles. Le coût de ce grand projet de modernisation est estimé à 800 K$.

Division des techniques d'intervention d'urgence (DTIU)

La Division est un centre technique national et ministériel en ce qui concerne les déversements de substances dangereuses, leurs caractéristiques, leur comportement, leurs effets et les mesures correctives applicables. La Division gère le Programme des déversements accidentels dans l'Arctique (AMOP) qui vise la mise au point et la démonstration de mesures de lutte contre lesdéversements de pétrole en région froide. On fait le point sur ce programme au séminaire annuel international AMOP.

Dans le cadre du Programme d'urgence contre les dangers chimiques (CHEC), on s'occupe de pourvoir aux besoins en information technique du personnel des services opérationnels, de mesurer le danger sur les lieux des déversements et de

fournir la technologie pour le nettoyage et la prévention des déversements de substances chimiques. On fait le point au Colloque technique sur le déversement de produits chimiques.

Outre les comptes rendus de ces rencontres et les rapports de projets, la Division publie le bulletin trimestriel "La lutte contre les déversements".

Faits saillants

1. À la suite de la demande d'aide de PE de l'Iode, la Division a apporté son assistance à l'évaluation du danger au dépôt de pneus incendié de Hagersville.

2. Le douzième séminaire annuel AMOP s'est tenu à Calgary du 6 au 8 juin et le sixième séminaire annuel CHEC, les 5 et 6 juin. C'était la première fois que ces deux séminaires avaient lieu en même temps : l'idée a été bien accueillie.

3. Le US Minerals Management Service (US MMS) a versé en tout 172 000 $ U.S. pour la réalisation de huit projets menés conjointement avec la DTIU et l'American Petroleum Institute s'est engagé à verser d'autre fonds pour certains de ces projets.

4. M. Merv Fingas était l'un des principaux conférenciers d'un atelier organisé par l'US MMS en Virginie en vue de déterminer quels sont les besoins de recherche en matière de déversements d'hydrocarbures et de faire le point sur les progrès réalisés.

5. M. Fingas a assisté à la réunion du Comité ASTM F-20 du 10 au 12 octobre à Clearwater et du 20 au 22 février à Phoenix.

6. La Division a fourni des services de télédétection aérienne et M. Fingas était à bord de l'avion envoyé sur les lieux du déversement du Komarg près de Saint-John au Nouveau-Brunswick.

7. M. Fingas a conseillé l'Exxon et la US National Oceanic and Atmospheric Administration (NOAA) au sujet des propriétés et du comportement du pétrole brut de la baie Prudhoe à la suite du déversement causé de l'Exxon Valdes dans les eaux de l'Alaska; G. Sergy et M. Fingas ont fourni de l'aide scientifique sur les lieux à la demande de l'Exxon. La consultation s'est poursuivie tout l'été.

8. On a mis au point une nouvelle méthodologie pour l'évaluation de l'efficacité du nettoyage de la zone littorale et les données recueillies ont beaucoup servi à ceux qui se sont occupés du déversement de l'Exxon Valdes. Les résultats de ces évaluations ont été présentés, sur demande, lors d'un atelier tenu en novembre en Alaska et en décembre 1989 à Washington.

9. M. Fingas a été invité à participer au processus d'examen de l'état de préparation en cas de déversementd'hydrocarbures qu'a entrepris le Congrès américain. Il s'agissait de deux rencontres à Washington avec présentation d'un exposé.

10. En décembre à Washington, M. Fingas a fait le point sur l'utilisation et l'efficacité des dispersants dans le traitement des nappes de pétrole devant un groupe de cadres supérieurs du gouvernement américain et de l'industrie qui en avaient fait la demande.

11. M. Fingas a assisté à une rencontre du CDSM/OTAN à Brest, en France, en septembre 1989. Il a fait trois exposés : la modélisation des déversements, les techniques d'analyse et les agents de traitement utilisés en cas de déversement. Il a été élu à la présidence du comité de la technologie de l'analyse et de la télédétection.

12. M. Harry Whittaker a travaillé au Comité d'examen public des systèmes de sécurité des navires-citernes et de la capacité d'intervention en cas de déversement en milieu marin à temps plein du 1er juillet 1989 au 28 février 1990 et à temps partiel en mars 1990.

13. M. Whittaker a été élu à la présidence du Comité ASTM F-20 sur les mesures d'intervention en cas de déversement de substances dangereuses ou d'hydrocarbures. Il a présidé la rencontre tenue du 20 au 23 février 1990 à Scottsdale en Arizona.

14. H. Whittaker a présidé le débat sur la séparation des déchets et ses applications en matière environnementale à la deuxième conférence internationale sur les scienceset la technologie des séparations qui a eu lieu à Hamilton en Iode du 1er au 4 octobre 1989. Lisa Keller et Monique Punt y ont présenté des communications.

15. On a utilisé des unités de micro-filtration et de petites unités d'osmose inverse dans un essai réalisé en collaboration avec Pluritec Inc. et Seprotech Inc. pour Environnement Québec. On réussi à traiter les effluents aqueux de rejets de porcs dans un essai de deux semaines.

16. En novembre 1989, o a fait un essai conjoint de trois semaines pour le bureau régional de l'Atlantique et Environnement Nouveau-Brunswick. On a pu démontrer l'efficacité de la micro-filtration, de la nano-filtration, de l'osmose inverse et de l'oxydation stimulée pour le traitement de plusieurs types de rejets et de substances s'écoulant des déversements.

17. Mme Lisa Keller a assisté à la démonstration de la technologie allemande du confinement et de la récupération en cas de déversement d'hydrocarbures à Wilhelmshaven et à

Hambourg, en Allemagne, en décembre 1989. Cette visite a eu lieu à la demande du comité d'examen public des systèmes de sécurité des navires-citernes et de la capacité d'intervention en cas de déversement en milieu marin.

18. On a fait plusieurs essais avec l'unité mobile Rayox d'oxydation stimulée aux U.V. de la DTIU. Le premier consistait à démontrer que l'unité peut détruire le 1,4 dioxane à une concentration d'environ 100 x 10^{-6}. Le second a eu lieu à Freehold au New Jersey : on a réduit la concentration de COV dans l'eau de quelques p. x 10^{-6} à des valeurs inférieures à 5 x 10^{-9}. Le troisième s'est déroulé à la base navale du Maryland : on a réussi à réduire la concentration de plusieurs composés explosifs, initialement d'une valeur pouvant atteindre 1 000 p. x 10-6, au moyen de l'unité d'oxydation stimulée. Ces dernières années, on a réalisé plusieurs essais expérimentaux avec l'unité Rayox.

Division de la mesure de la pollution (DMP)

La Division s'occupe de coordonner le Réseau national de surveillance de la pollution atmosphérique (RNSPA) qui comporte 380 instruments de surveillance de l'atmosphère installés dans 130 stations d'échantillonnage réparties entre 52 grandes régions urbaines du Canada.

La Division veille aussi à l'évaluation et à la mise au point de la nouvelle technologie de la mesure de la pollution de l'air pour le RNSPA et pour des dossiers prioritaires comme le TADPA et les produits toxiques.

Les activités de surveillance à la source comprennent notamment : mise au point et révision de méthodes de référence pour la mesure des rejets industriels de sources fixes en vertu de la réglementation et des directives de la LCPE; mise au point de nouvelles méthodes de mesure des rejets adaptées aux nouvelles priorités; évaluation des appareils de surveillance commerciaux servant à mesurer les rejets gazeux en temps réel; application des méthodes de mesure des rejets à la source pour répondre aux besoins d'information du ministère, à diverses fins; recherche expérimentale sur l'incinération des déchets dangereux.

Faits saillants

1. La troisième rencontre des gestionnaires en technique du RNSPA a eu lieu à Vancouver; plusieurs membres de la Section de la mesure de la qualité de l'air y ont participé. Un rapport récapitulatif a été distribué aux participants.

2. On a refait au complet la présentation du RNSPA d'après une conception entièrement nouvelle pour l'exposition internationale de GLOBE90. On a ajouté aux dossiers présentés les dernières données recueillies dans les stations

pour faire une présentation à jour du réseau. On a aussi préparé des diapositives sur les tendances de la pollution pour cette exposition.

3. Depuis décembre 1989, un contractuel s'occupe de la base de données M204 du RNSPA; toutes les données recueillies depuis 1974 y ont été versées; on a mis au point des programmes de saisie de données et de validation; le format d'enregistrement de la base de données a été amélioré; ce travail doit se poursuivre durant la prochaine année financière.

4. La DMP a aidé la Division des techniques d'intervention d'urgence (DTIU) dans l'évaluation des effets de l'incendie du dépôt de pneus de Hagersville. On a monté et étalonné deux échantillonneurs de HAP pour le relevé. Des employés de la DMP se sont rendus sur les lieux durant l'incendie pour faire les échantillonnages.

5. Dans le cadre du programme de surveillance de C et P, région de l'Iode, pour l'incinérateur de Détroit, la Division s'occupe de deux stations de surveillance du secteur de Windsor. On y mesure la concentration dessubstances suivantes: dioxines, furanes, hydrocarbures aromatiques polycycliques, BPC, chlorophénols, chlorobenzènes, composés organiques volatils, particules absorbables par inhalation et éléments métalliques. Un rapport comprenant tous les résultats rassemblés de juillet 1987 à septembre 1988 est paru en avril 1990. Un deuxième rapport, sur la période allant de septembre 1988 à octobre 1989, est au stade de préparation final.

6. On fait des échantillonnages d'air pour la détection de HAP dans quatre villes, soit Montréal, Jonquière, Toronto et Hamilton, en plus des deux stations du secteur de Windsor. Des rapports préliminaires ont été produits.

7. La Division a participé activement à l'élaboration du plan de gestion des NO_x et des COV du Canada ainsi qu'au processus de consultation publique mis en oeuvre à cette fin. La Division a notamment fait une présentation aux séances d'information publique, participé à des ateliers réunissant les parties intéressées à divers points de vue et à des ateliers techniques, analysé en profondeur les données recueillies sur les concentrations d'O_3, de NO_x et de COV au Canada, examiné les commentaires techniques portant sur les versions préliminaires du plan et rédigé certaines parties du plan.

8. On a assisté à une session de négociations de la Commission économique pour l'Europe (CEE) concernant l'élaboration d'un protocole international sur les COV à Genève.

9. Le projet de collaboration de R&D sur l'échantillonnage et l'analyse des dioxines dans l'air, parrainé dans lecadre du troisième volet annuel du programme de travail du Conseil

canadien des ministres de l'Environnement (CCME), a reçu l'approbation du comité du CCME chargé de s'en occuper. Parmi les activités prévues, mentionnons l'étude comparative interlaboratoire de six laboratoires canadiens et un atelier tenu à Toronto où sont venus 100 participants. Les résultats du programme de travail ont été présentés à la conférence Dioxine 89.

10. La Division a présidé un groupe de travail technique conjoint fédéral/provincial/industriel à la demande de l'industrie pour étudier la possibilité de modifier la méthode de référence (MR) actuelle concernant l'amiante. On a organisé des rencontres pour définir le mandat du groupe de travail et les questions à étudier, comprendre le point de vue de chaque partie et convenir d'un plan d'action. On a défini les besoins en ressources et réparti les responsabilités techniques et financières. La Division a présenté un projet d'étude au groupe de travail. Les essais sur le terrain doivent commencer vers le milieu de 1990. Les résultats de l'étude permettront de déterminer si la méthode de sélection proposée est acceptable, et peut s'intégrer à la réglementation de la LCPE, et si la limite de rejets s'appliquant actuellement doit être ajustée en considération d'un éventuel changement majeur des méthodes de mesure.

11. La Division a fait une présentation à l'atelier sur le règlement sur les fonderies de plomb de seconde fusion pour expliquer la technologie des mesures à la source aux inspecteurs qui veillent à ce que la réglementation sur les rejets de la LCPE soit respectée. On leur a expliquéles principes fondamentaux de l'échantillonnage et de l'observation sur place.

12. La participation de la Division au projet d'incinération des BPC de Goose Bay s'est traduite par les activités suivantes :

    a) *Planification de projet.* La Division a discuté des divers aspects d'un programme de vérification de la conformité des rejets avec des représentants du bureau du district de Terre-Neuve, de la Direction de la gestion des déchets, de la province, du MD et de l'entrepreneur général Proctor & Redfern. On a donné des services de consultation technique sur l'échantillonnage, les protocoles d'AQ/CQ, les priorités quant aux procédés et aux paramètres des rejets à évaluer, les estimations de coûts et divers autres aspects de la vérification de la conformité.

    b) *Vérification, AQ/CQ et observation sur place.* On a rédigé un plan de vérification de l'échantillonnage à la source qu'on a remis aux participants du projet. On a examiné le plan de vérification de la conformité des Clean Air Engineering et transmis les commentaires qui ont été formulés à l'inspecteur contrôlant l'application de la LCPE dans le district de Terre-Neuve. L'opération

de vérification et d'observation sur le terrain comme telle a eu lieu à Goose Bay en janvier 1990. On en a évalué les résultats et préparé un rapport.

c) *Essais d'Environnement Canada.* La Division a remis un plan de vérification aux participants du projet et a fait une série d'essais portant sur les rejets gazeux de l'incinérateur mobile. On a recherché des particules, des BPC, des dioxines, des furanes et du HCl.

13. La Division a participé au Programme de réduction des émissions des chaudières des installations fédérales (PRECF) de la DPI par les activités suivantes :

a) *Promulgation de la réglementation de la LCPE.* On a transmis à la DPI la réglementation proposée après examen et formulation de commentaires. La Division a évalué le rendement d'un analyseur de gaz portatif et, d'après les résultats de l'expérience sur le terrain, mis au point une nouvelle méthode de référence devant être intégrée au projet de règlement. La Division a aussi participé aux travaux du groupe d'étude du PRECF et donné des conseils techniques à la DPI ainsi qu'à d'autres membres du groupe du PRECF sur divers aspects de la mesure des rejets à la source.

b) *Étude de SÉA.* La Division a participé à des essais sur le terrain réalisés conjointement avec le secteur privé en vue d'évaluer le rendement d'une unité de recirculation des gaz de carneau conçue pour réduire les rejets de NO_x. On a mesuré en continu les NO_x, SO_2, CO, CO_2, O_2, hydrocarbures totaux, degré d'humidité, température et vitesse de déplacement dans les conduits de la chaudière de base et de la chaudière modernisée dans 36conditions expérimentales en utilisant divers combustibles. Les résultats ont été transmis à la DPI et à Ortech.

c) *Contrôle fédéral des chaudières de la RCN.* On a contrôlé 24 chaudières exploitées par TP dans la région d'Ottawa à la recherche de rejets de NO_x, SO_2 et CO. La DPI s'est servie des données ainsi recueillies pour évaluer les rejets des chaudières du gouvernement fédéral dans différentes conditions d'exploitation. Les résultats des tests ont été transmis à la DPI et à Ortech.

d) CBF Halifax. La Division a envoyé quelqu'un sur les lieux qui a aidé le spécialiste conseil à mettre le programme d'essais en oeuvre.

14. La participation de la Division au projet commun de démonstration de l'incinérateur mobile (Vesta à Swan Hills) s'est traduite notamment par les activités suivantes :

a) Planification de projet générale. La Division n'a pas cessé de fournir des conseils techniques aux autres membres du Comité technique durant la planification et la conception du projet. Elle a participé à des rencontres avec les représentants des organismes suivants : EC,ME de l'Iode, ME du Québec, Hydro-Québec, Iode Hydro, Chem-Securities, Western Research, Concord Scientific et Vesta.

b) AQ/CQ et observation sur place. La Division a assumé les responsabilités en tant qu'autorité scientifique aux termes du contrat d'AQ extérieure. La négociation des protocoles et conditions d'évaluation avec les divers participants a pris beaucoup de temps. On a finalement conclu un accord et un plan a été produit et distribué. Un employé de la Division était sur les lieux durant la première phase du programme d'essais. Les essais ont toutefois été interrompus à la suite d'un déversement accidentel. Les activités reprendront au début de l'année fiscale 1990-1991.

Laboratoire d'analyse des gaz d'échappement des véhicules (LAGEV)

Le Laboratoire évalue les gaz d'échappement dans le cadre du programme de vérification de la conformité du gouvernement fédéral sur les nouveaux véhicules légers mis en vente au Canada. Ce programme conjoint de Transports Canada et d'Environnement Canada sert à évaluer les gaz d'échappement/d'évaporation et les rejets de particules pour déterminer s'ils sont conformes aux normes et règlements de la Loi sur la sécurité des véhicules automobiles.

Le Laboratoire étudie les carburants et moteurs de remplacement pour déterminer quel impact ils pourraient avoir sur la qualité de l'air au Canada et définir des facteurs de rejet permettant de prévoir les rejets totaux au Canada.

Le Laboratoire concourt à la réalisation de programmes conjoints gouvernementaux et industriels visant à mettre au point de nouvelles techniques ou à optimiser l'utilisation de l'équipement actuel pour améliorer le rendement, économiser l'énergie et réduire les rejets.

Le Laboratoire réalise des programmes d'essais pour mettre à jour les estimations des rejets du parc de véhicules canadien, s'occupant notamment de la surveillance des véhicules en usage, des effets de la température et des effets des altérations. D'après les résultats, le gouvernement formule des règlements et des directives en vue de mieux protéger l'environnement canadien.

Le Laboratoire dirige un programme unique en son genre en matière de consultation et d'aide technique, avec un service d'essais limité à l'intention de l'industrie. Ce programme porte notamment sur l'évaluation des économiseurs de

carburant et comporte des services d'assistance pour le public, les gouvernements, les industries et les établissements publics.

Faits saillants

1. Le Laboratoire a commandé une enceinte de contrôle pour véhicules lourds afin d'évaluer les autobus des transports en commun et les camions de transport. Cette installation permet de faire des essais à la température ambiante et de caractériser les gaz d'échappement du véhicule.

2. Le Laboratoire a aménagé un laboratoire d'analyse des composés organiques, élargissement du couloir de dilution où l'on peut faire l'échantillonnage et l'analyse des composés organiques.

3. Le Laboratoire a participé à trois programmes de corrélation de véhicules industriels qui ont donné d'excellents résultats. La North American Motor Vehicle Manufacturers Association et la Japanese Automotive Manufacturers Association en ont assuré la coordination.

4. Le Laboratoire a mis au point une technique de mesure des rejets d'hydrogène des véhicules électriques. Cette méthode a été appliquée dans un programme d'évaluation, portant sur un prototype de camionnette "G-van" destiné à la commercialisation, réalisé avec la Universe Engineering (Magna International).

5. On a caractérisé les gaz d'échappement d'un véhicule Ford à alimentation polyvalente de carburant en vue d'étudier les effets de la teneur du carburant en méthanol lorsque celle-ci est augmentée de 0 % à 85 %.

6. On a commencé l'évaluation d'une Chevrolet Lumina 1990 convertie au gaz naturel au moyen d'un système à deux carburants. La deuxième partie des essais devrait se faire durant l'année fiscale 1990-1991, une fois qu'on aura installé un système d'injection de carburant gazeux sur le véhicule.

7. On a réalisé une série de projets d'essais avec la PGA (Propane Gas Association) en vue d'optimiser le débit d'alimentation en carburant, pour réduire les rejets et la consommation d'énergie, et en vue d'évaluer les rejets par temps froid et de caractériser les gaz d'échappement.

8. Le Laboratoire a évalué des rejets pour l'Université Concordia, le seul organisme canadien à participer au marathon du méthanol de la GM en 1989. Les rejets étaient un facteur à considérer pour gagner cette course dans laquelle l'Université Concordia s'est placée en deuxième position dans un peloton de 15 concurrents.

9. Le Laboratoire a commencé à évaluer la caractérisation des gaz d'échappement des autobus de transports en commun à moteur diesel. Les résultats serviront de base dans l'évaluation des autobus à carburant de remplacement.

10. L'agrandissement du Laboratoire s'est achevé en juillet 1989 et les locaux ont été affectés. Le Laboratoire possède maintenant une zone d'échange de carburant à l'épreuve des explosions et une enceinte pour les travaux de recherche réalisés dans le cadre des programmes gouvernement/industrie.

11. Le Laboratoire a réalisé deux projets d'évaluation par temps froid pour la DST/DIP. Dans le premier projet, il s'agissait d'évaluer les rejets produits dans les conditions ambiantes par des véhicules conçus suivant la technologie de pointe; dans le second, on évaluait les rejets d'un mélange à 10 % d'éthanol et d'un mélange à 11 % de MTBE à basse température.

12. Le Laboratoire a terminé le programme de vérification de la conformité des modèles de l'année 1989 (64 véhicules) et commencé le programme d'évaluation des modèles de 1990 (45 véhicules).

Director's Office

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Direction, Management and Support 3300-67100

Project Manager: D. Thornton (998-3671)

Objective

To ensure efficient and cost-effective delivery of RRETC programs.

Relevance

Efficient provision of hands-on technical support and R&D in the areas of air pollution and environmental emergency countermeasures technology are necessary to support the departmental programs relating to environmental protection.

Work Plan

1. Develop operational and work plans for the Centre.
2. Prepare regular activity reports including an annual report.
3. Provide functional administration and technical support (computing and instrument maintenance).
4. Oversee the operation, maintenance, and up-grading of the building and associated services.

Status Report - March 31, 1990

1. Plan developed and submitted.
2. Quarterly "Synopsis Reports" prepared, and annual report for FY 1988-1989 completed, and other summaries prepared as required.
3. Central computing expertise and workshop facility maintained.
4. Building up-grading program continued, including completion of majore projects like removal of faulty ceiling insulation, construction of additional fire walls, and installation of a building-wide sprinkler system.

NEW

5. The development of eleven discussion papers on marine spill preparedness and response was co-ordinated as part of an interdepartmental review. The papers and briefings on their contents were provided to the Public Review Panel on Tanker Safety and Marine Spills Response Capability which was announced by the Prime Minister in June, 1989.

Safety and Health 3300 - 67110

Project Manager: D. Thornton (998-3671)

Objective

To ensure delivery of RRETC programs in a way which protects health and safety.

Relevance

The protection of RRETC staff and others during program delivery is essential for humanitarian, policy, and legislative reasons.

Work Plan

1. Implementation of WHMIS legislation.
2. Implementation of the provisions of the Emergency Response Plan.
3. Co-ordinated collection and disposal of chemical wastes.
4. Environmental audit of RRETC (Pilot Study)
5. Effective Safety and Health Committee.

Status Report - March 31, 1990

1. Requirements of WHMIS implemented through posting of Material Safety Data Sheets, WHMIS training sessions for staff, in-house contractors, and students, and up-dating of building-wide chemical inventory.
2. Draft Emergency Response Plan distributed to all staff and provisions followed during evacuation exercises and false alarms.

3. Central co-ordination of lab chemical wastes maintained through Building-wide Co-ordinator and a contract with a licensed waste-disposal company.

4. Draft report on pilot environmental audit completed, and response initiated.

5. S&H Committee meetings held monthly, and a regular newsletter on activities, tips, etc. prepared by the committee. (Management Representative: D.A. Williams)

Biological Testing Development and Use 3300 - 67120

Project Manager: G. Sergy (403-468-8039)

Objective

To enhance the quality, application, acceptance and effective usage of biological tests and test data by C&P nationally.

Relevance

Supports implementation and enforcement of Departmental and national legislation and policy; provides nationally consistent methodology and quality, environmental regulation control standards; environmental assessment procedures, integrated multi-disciplinary approach to toxic substance management.

Work Plan

1. Biological Testing Methods Standardization. Continue a multi-year program for development and publication of "Environment Canada, Aquatic Biological Test Methods" with priority on standards required by the Fisheries Act - Effluent Regulations, CEPA - new and existing substances and ocean dumping provisions.

2. Biological Testing Applications and Capability. Develop and promote a program to meet the biological testing requirements for C&P's regulations and toxic substance management framework.

Status Report - March 31, 1990

1. (a) Completed internal and external review of, and submitted for publication, three generic acute lethality testing

methodologies (rainbow trout, daphnia, and threepine stickleback).

b) Completed internal draft of legal and monitoring test protocols to be cited in the new Pulp and Paper Regulations (rainbow trout and daphnia).

c) Completed first draft of three sublethal testing methodologies (Ceriodaphnia-life cycle; fathead minnow larval growth and Microtox).

d) Completed initial draft and development plan for marine amphipod sediment lethality test.

2. a) Prepared and presented to various audiences, a five year program plan to meet new and on-going program needs.

b) Facilitated C&P laboratory co-operation and co-ordination, in conjunction with other EP Branches and Regions, with respect to the research, development, quality and provision of ecotoxicological methods and approaches.

c) Represented TDB on the Inter-Governmental Aquatic Toxicity Group.

d) Prepared a policy statement on the role and use of ecotoxicological tests.

Chemistry Division

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Organic Analysis / Methods 3200 - 67600

Project Manager: C. Chiu (613-998-3671)

Objective

Provision of trace and ultra-trace organic analyses on a variety of samples including ambient air and source emission (stack) samples; industrial process feedstocks, ashes, wastewaters and leachates; oils, soils sediments and groundwater; and other matrices of environmental concern. Samples are generally analyzed for a number of constituents such as chlorinated dioxins an furans (PCDD/PCDF), polychlorinated biphenyls (PCB), chlorinated benzenes and phenols (CB, CP), polycyclic aromatic hydrocarbons (PAH) and other aliphatic and aromatic compounds. New analytical methods are developed in support of regulations for specific pollutants and existing protocols are refined to ensure validity of reported results produced from service analyses.

Relevance

Dioxins and furans are among the most toxic chemicals known and, along with other chlorinated organic compounds such as PCB's, chlorinated benzenes and chlorinated phenols, can pose serious environmental threats. Other organics like PAH's are known carcinogens. Accordingly, there is considerable concern in the general population over the hazards of such substances to health, property and the environment. Such toxic organic substances can be produced from a variety of industrial processes and can also be of environmental concern in waste dump sites or accidental spill situations. Accordingly, there is a need for timely and accurate analysis of such compounds and research on methods of measurement and removal of such substances from the environment.

Work Plan

ANALYSIS:

601 NITEP/USEPA RDF testing: Approximately 200 analyses for PCDD/PCDF, PAH, PCB, CB, CP, Isomer Specific PCDD/PCDF.

602 Provide QA/QC support and analyses to Quebec Region for an ambient air PAH study in Quebec.

603 Continue analysis for PAH & N-PAH on NBS study of oil burn residues in collaboration with EETD.

604 Continue analysis of Windsor-Walpole ambient air samples (re Detroit Incinerator background study) for PCDD/PCDF, PCB, CB, CP, PAH.

605 Provide PCDD/PCDF analyses to Ontario Region on water/effluent samples, collected in Thunder Bay, related to operations of Northern Wood Preservers.

606 Provide additional PAH analysis from the expanded NAPS network which will include new stations at Hamilton, Sarnia and Toronto.

607 Provide analysis and QA/QC support to the federal government's PCB burn at Goose Bay, Labrador.

608 Provide QA/QC analysis on sludge, pulp and effluent samples collected as part of the CPPA sponsored National Pulp Mill Sampling Plan.

609 Provide PCDD/F analysis for Atlantic Region of soils and water samples from Newfoundland Hardwoods to evaluate environmental significance in switching from creosote to PCP as a wood preserving agent.

610 Analyze a few extra ash samples from the Chatham CFB survey completed last fiscal year.

611 Analyze samples from a round-robin evaluation of the proposed ambient air method for PCDD/PCDF and contribute expertise to a workshop at the 1989 Dioxin Conference to finalize these protocols.

612 Participate in a CCIW-initiated round-robin study on PCDD/PCDF in sediments.

613 Provide analyses or other technical support to CEPA regulatory and enforcement actions as they evolve.

614 Provide WNR with up to 10 PCDD/PCDF analyses of samples from Wood Buffalo National Park and from treated wood samples associated with the use of PCP.

615 Provide QA/QC support and analyses to Atlantic Region for the Sydney Tar Pond Cleanup.

616 Provide emergency organic analysis from spills or other environmental incidents and respond to other small projects that develop throughout the year - typically 10-15 of these are requested. Our capacity to respond to these requests is very limited.

METHODS:

620 Complete analytical protocols for PCDD/PCDF, PCB, PAH, CP, CB from MSW incinerator testing.

621 Complete analytical protocols for PCB in Oil, Soil and stack emissions.

622 Complete development of isomer specific PCDD/PCDF analysis for the seventeen, 2,3,7,8 substituted PCDD/PCDF congeners.

623 Continue development of SVOC analytical methods for automotive emissions as part of a joint research effort with VETL to obtain baseline information on these parameters.

624 Evaluate RIA techniques for PCDD/PCDF in complex environmental matrices, particularly air-related samples.

625 Develop, modify or refine analytical methods for other organic compounds as required.

ADVICE / SUPPORT:

630 Provide technical advice on organic analytical principles, procedures and instrumentation as required.

631 Review technical proposals for contract analytical work, provide advice on appropriate methods and recommend appropriate QA/QC protocols.

632 Attend courses, conferences and technical meetings to keep abreast of the latest developments in environmental analytical chemistry.

Status Report - March 31, 1990

ANALYSES:

601 Analyses of PCDD/PCDF, PCB, CB, CP and PAH were completed on 71 proof rinses, 63 stack emissions, 50 process ashes, 15 leachates and 13 external QA/QC samples. Of 212 samples, 42 selected samples were analyzed for the 17 2,3,7,8-substituted congeners as well as congener groups of PCDD/F using Hi-Res MS at 10,000 resolution. Analytical performance on two batches of audit samples submitted by US EPA were satisfactory. A report describing our analytical procedures used for this program has been prepared and included in Volume III of the NITEP report.

602 At the request of Quebec Region, audit samples of urban dust and solutions were submitted to two contract labs for PAH analysis. Analytical performances of contract labs were evaluated and ranked, and recommendations were provided.

603 A batch of 12 oil samples for the NBS study of oil burn residues was received in March for PAH analysis. Method development on sample cleanup is being carried out to improve the quality of data.

604 A total of 94 ambient air samples from Windsor and Walpole sites were analyzed and reported. Because of the extremely low level (less than 10 pg/m3) of PCDD/F and the relative high level of organic background in ambient air samples, it was difficult to provide high quality results using Quadrupole MS. Therefore, all ambient air samples collected since April 1989 have been analyzed using Hi-Res MS.

605 a) Analyses of 16 harbour water samples from Thunder Bay for PAH and PCDD/F were completed.

b) Analyses of 25 effluent samples from Domtar Wood Preservation Facility for PCDD/F were completed. The second phase of this study will be conducted in FY 90/91.

606 New stations at Hamilton, Junction Triangle, Montreal and Arvida were included for PAH monitoring since January 1989. A total of 45 samples were analyzed for PAH.

607 Completed analyses for PCB and PCDD/F on 15 proofing samples. A total of 15 pairs of Tenax cartridges of blank and test samples were analyzed for Volatile organics (40 compounds). Test samples were not analyzed successfully due to the high moisture content in the sample.

608 a) Analyses of 26 QA split samples including pulps, sludges and effluents from various pulp mills for PCDD/F using Hi-Res MS were completed.

b) As a member of the Dioxin QA Committee, QA and raw MS data of more than 200 sample analyses submitted by the contract lab were carefully audited, and comments and recommendations were provided.

609 No follow-up by client/collaborator. Project cancelled.

610 Two ash samples from the Chatham CFB survey were analyzed for semi-volatile organics.

611 Participated in an interlab study sponsored jointly by Ontario MOE and RRETC. The study was completed and a paper was posted at the *Dioxin 89* conference.

612 Participated in several NWRI-initiated interlab comparison studies by analyzing 4 sediments for PCDD/F, 12 water samples for PAH, 5 sediments for chlorophenols and 6 PCB solutions.

613 a) At the request of Industrial Programs Branch (IPB), 3 scrubbing water samples from a regeneration facility of Petrocan Oil Refinery in Montreal were analyzed for PCDD/F.

b) The Reference Method for the determination of PCDD/F in pulp mill effluents was drafted and is being reviewed internally. The second draft of the method will be distributed in early April to government agencies and industries for review and comment.

614 No follow-up by client/collaborator. Project cancelled.

615 No follow-up by client/collaborator. Project cancelled.

616 a) At the request of Agriculture Canada, one of Loblaw's Lawn and Garden fertilizer samples was analyzed for PCDD/F.

b) In response to the contaminated fuel crisis, a total of 160 fuel and chemical waste samples were analyzed for PCB and chlorobenzenes during May and June.

c) Because of the accidental emission of smoke and particulates from the Goose Bay PCB Destruction Unit, 7 swab, soil and water samples were analyzed for PCB and PCDD/F.

d) In response to the Hagersville tire fire, a total of 50 pairs of PUFs and glass cartridges were cleaned and prepared for sampling.

METHODS:

620 The analytical method used for the determination of semi-volatile organics in emission samples from MSW incineration testing - NITEP III was prepared.

621 A Reference Method for the analyses of PCDD/F and PCB in feed, process ash and stack emissions samples from PCB waste incineration was prepared.

622 The selection of GC columns for the analysis of PCDD/F congeners with chlorines in the 2,3,7,8-positions was investigated. Recommendations and procedures for using these GC columns are described in Chemistry Division's analytical reports.

623 Dilution tunnel blanks, background air and emission samples from two OC Transpo buses were collected for PAH analysis.

624 No activity. Staff and time shortage.

625 A reverse GP column was tested on a HPLC system to remove oil from PCB solutions. Results were reproducible with recovery in the range of 80-90%. Because of the limitation in column capacity and sample dilution, the minimum detectable amount of PCB is 2ppm. With a prep-scale column the D.L. can be extended to 0.2 ppm. A home-packaged prep-scale GP column with BioBead S-X3 is currently under evaluation.

ADVICE/SUPPORT:

630 a) The new HP MSD (model 5971) was evaluated by analyzing low levels of PAH and dioxin standard solutions. Sensitivity for full scan analysis was found to be lower than the older model (597OA) by a factor of 2-4. For selected ion monitoring analysis, however, no significant improvement in sensitivity was observed.

b) Dr. Simon Buckland of Department of Scientific Industry Research, New Zealand, visited our lab on September 26 to acquire information on dioxin analysis for municipal solid waste incineration studies.

631 a) Technical review on two papers for *Dioxin '89* publication was provided.

b) The first draft of a dioxin method prepared by B.K. Afghan, Canada Centre for Inland Waters, was reviewed and commented on.

c) Technical information and recommendations pertaining to dioxin QA/QC protocols for the ocean dumping program were provided to P. Kluckner, Pacific Region.

632 a) R Halman and C. Chiu attended the 9th International Symposium on Chlorinated Dioxins and Related Compounds, September 18-22, Toronto.

b) C. Chiu presented CD's dioxin analytical method at the Dioxin in Ambient Air workshop sponsored by Ontario MOE and RRETC, September 17, Toronto.

c) K. Li, R. Halman and C. Chiu attended the Method Development Seminar '89 sponsored by NWRI, May 24-25.

d) K. Li, attended the 34th Pittsburgh Conference, March 5-9, New York.

e) M. Lanoy completed the six 3-hour sessions statistics course sponsored by the Applied Statistic Division.

f) M. Lanoy completed the 3-day Advance Lotus 123 course, May 17-19, Ottawa.

g) K. Li completed the 5-day Project Management course, May 29-June 6, Ottawa.

h) R. Thomas completed the 5-day 70/ZAB operator course, September 18-22, Manchester, UK.

SAMPLES ANALYZED BY ORGANIC LABORATORY
APRIL 1, 1989 - March 31, 1990

Sample Type	Samples Processed	PAH	PCB	CB	CP	PCDD/F	VOC	Total Analyses
Ambient Air	201	201	45	45	45	45		381
Incineration	244	214	214	214	214	229	15	1100
Effluent	34					34		34
Pulp Mill	26					26		26
Tainted Fuel	160		160	77				237
Swab	7		7			7		14
Round-Robin	31	12	6		5	8		31
Method Development	60	20	30			10		60
Solvent Waste	16		16			16		32
Total	779	447	478	336	264	375	15	1915

Inorganic Analysis / Methods 3200-67650

Project Manager: J. Dlouhy (998-3671)

Objective

Provision of inorganic analyses of samples from the National Air Pollution Surveillance (NAPS) network; from special ambient air and source emission (stack) testing studies; from retail gasoline sampling tests and other programs of environmental significance. Sample matrices include filters, solutions, process feedstocks and ashes, gasolines and other commercial products which are analyzed for a variety of components such as common anions (SO_4, NO_3, F, Cl, PO_4, NO_2), toxic metals (Pb, Hg, As, Se) and simultaneous multiple-element (40) assays of dichotomous filters. New analytical methods are developed in support of regulations for specific pollutants and existing protocols are refined to ensure validity of reported results produced from service analysis.

Relevance

The NAPS network is used to collect data on ambient air pollution levels in urban centres across Canada. Special ambient air surveys are also conducted to measure levels of toxic inorganics identified under CEPA. Data on levels of inorganic compounds, such as nitrates and sulphates,

can be used to delineate the extent of the acid rain problem in Canada and such data can supplement other important studies like the long range transport of air pollutants, which have both regional and international implications.

Work Plan

ANALYSIS:

651 Analyze NAPS Hi-Vols for lead , SO_4/NO_3 and arsenic.

652 Analyze NAPS Dichot filters for SO_4/NO_3, other common anions, and for 40 toxic metals and elements.

653 Analyze NAPS SSI filters for lead and SO_4/NO_3 .

654 Analyze inhalable particulate filter samples (Dichot) for SO_4/NO_3 and multi-element assay of 40 metals and elements as part of Windsor/Walpole studies.

655 Analyze Dichot filter samples for 40 elements as part of a special ambient air study in Cornerbrook, Newfoundland in support of Newfoundland Department of Environment and Lands.

656 Analyze about 400 samples from Cornwall Island Fluoride studies for Ontario Region.

657 Analyze gasoline samples submitted by regional offices to determine compliance with leaded gasoline regulations.

658 Provide inorganic analyses for small projects that develop throughout the year.

METHODS:

670 Continue development/refinement of methods for SO_4/NO_3 and other anions and multi-element analyses by EDXRF.

671 Continue participation in inter-lab QA studies with USEPA, Manitoba Environment and Alberta Research Centre.

672 Maintain QA charts for tracking performance of production analysis methods

ADVICE/SUPPORT:

680 Provide technical advice on inorganic analytical principles, procedures and instrumentation as required.

681 Review technical proposals for contract analytical work, provide advice on appropriate methods and recommend appropriate QA/QC protocols.

682 Attend courses, conferences and technical meetings to keep abreast of the latest developments in environmental analytical chemistry.

683 Maintain lab facilities and equipment that are often seriously compromised by power failures and inadequate ventilation and humidity control for critical equipment.

Status Report - March 31, 1990

A tabular summary of inorganic analyses performed during the year is provided at the end of this status report. Hilites or commentary on individual projects in the work plan are given below.

ANALYSES:

651-654 a) All NAPS-related analyses were routinely handled on an on-going basis throughout the year. The number of samples provided and analyses completed are given in the summary table.

b) Dichot filters from the Windsor/Walpole studies continued on a regular basis. Over 60 multi-element and anion analyses were reported to Ontario Region.

655 The dichot analyses for metals and anions in support of the Cornerbrook ambient air study were completed and results transmitted to the Newfoundland Department of Environment and Lands.

656 The Ontario Region has made other arrangements for fluoride analyses for the Cornwall Island program.

657 A number of gasoline samples from retail outlets were analyzed for Ontario Region (Ottawa District Office). Numerous discussions with O.R. officials and legal advisors were held in regards to a possible prosecution based on our legal analyses. The matter remains outstanding but several re-analyses of the sample were carried out using both the "*official*" 1973 method and the current updated versions.

658 A number of analytical runs were provided through the year including;

a) A sea-water corrosion experiment from EETD

b) Measurement of lead in filter samples from heavy-duty vehicle emission tests in VETL to determine possible sources of contamination

c) Determination of arsenic in samples from the Vesta mobile PCB incinerator testing in Alberta

d) Copper assays on solutions submitted by EETD

e) Elemental analysis of impinger solutions from battery charger tests of electrically powered vehicles were completed, reported and discussed with VETL.

METHODS

670 a) A stability study on sulphate and nitrate standards was completed and a report prepared.

b) Comparison experiments on the use of gradient and isocratic elution on the Ion Chromatographs for analyzing virtual dichotomous filter samples were carried out.

c) IC procedures were modified to allow processing of more individual sample sets during the day and to allow continuous automated processing throughout the weekend.

d) Extensive re-working of calibration and deconvolution programs for the EDXRF were required following the several serious malfunctions of the KEVEX spectrometer.

e) An update of the measurement procedures for the Siemens XRF system was completed and implemented.

f) An independent method comparison study of phosphorus, sulphur, chlorine and bromine analyzed by X-Ray Fluorescence and Ion Chromatography for dichotomous filters was completed and reported.

ADVICE/SUPPORT

680 a) A number of laboratory visits and meetings occurred to discuss technical aspects and analytical procedures with representatives of several organizations, including: Dionex Canada; Energy Mines and Resources; Areco Canada Ltd.; Technicon Canada; Delegation of scientists from India; University of Waterloo; Health and Welfare Canada; Agriculture Canada.

b) Comments were submitted on the first draft of a CGSB method "Standard Test Method for the Identification of Individual Hydrocarbon Compounds in Canadian Automotive Gasoline using Gas Chromatography".

c) A meeting was attended with officials from the Dept. of Chemistry, Carleton University to discuss participation in their proposed "Centre for Analytical Environmental Chemistry".

d) A review of the proposed RM for HF in ambient air was carried out and reported to J. Hilborn, State of the Environment Branch.

681 a) A request was received from PMD on recommended methods and equipment to be specified for the analysis of inhalable particulates in air samples.

b) An evaluation of a new proposed U.S. EPA method (7D) for the determination of NO_x in stack emission samples was undertaken.

682 Staff of the inorganic laboratory attended a number of courses, conferences, symposia, etc.

- 38th Annual Denver X-Ray Conference (J. Dlouhy)
- Spectroscopy Society of Canada (J. Dlouhy)
- Dionex Analysis Seminar (N. Houle)
- Fire Extinguisher Training (all staff)
- State of Environment Reporting seminar (Dlouhy, Houle)
- Seminar on "Chemistry of the Ozone Layer" (J. Dlouhy)
- Course on Respiratory & Personal Protection in the Lab (all staff).

683 a) Major facility upgrading projects, such as the installation of sprinklers, relocation of offices, etc., contributed to a number of problems causing delays in sample processing in the labs. Roof leaks and collapsing ceilings - particularly in the AA laboratory - are persistent problems .

b) There were a number of critical failures of the EDXRF spectrometer and associated computer systems. Because of a building-wide power failure, the filament in the x-ray tube was damaged and a replacement tube had to be purchased at a cost of $12,000.00. Problems with the Bernouilli disks and drives were also experienced which took some time to resolve. Field response by KEVEX to our problems continues to be slow. - for example, instrument problems causing poor spectra resolution required more than two months of negotiations with Kevex before the problem was found and corrected. A significant backlog of samples resulted from this two month period when the instrument was not usable. Some of our problems relate to outdated computer technology as new spectrometers have significantly improved electronics and are controlled with a NEC 80386 processor replacing the Delta System. Our 8000 system is the predecessor to the Delta technology.

c) Problems continue with our extremely old A-A unit (PE model 403) used for hydride generation analysis of arsenic. It is becoming increasingly more difficult to find tubes and other ancient components to replace damaged amplifiers & other controls.

d) A plan for upgrading the water purification system and glassware washing facilities was developed and design drawings prepared. Renovations will be completed in FY 90/91, pending availability of funds.

e) A building-wide status report on all fume-hoods was prepared at the request of the Director. Deficiencies were recorded and brought to the attention of DPW staff.

f) A total of three new personal computers were purchased and installed in the lab and a number of new software packages, peripherals. Interfacing with laboratory instruments was implemented.

g) A surplus atomic absorption spectrometer (PE 503) was transferred to NRC labs and a surplus x-ray diffractometer transferred to EMR labs when this equipment was not accepted from within C&P when offered through the Lab Manager's Committee.

h) A "Workplace Inspection Check-List" was developed and a survey of Inorganic labs completed.

i) Emergency response procedures relating to the use of the X-ray fluorescence spectrometers were developed and posted in the X-ray laboratory.

SAMPLES ANALYZED BY INORGANIC LABORATORY
April 1, 1989 - March 31, 1990

Statistics	Fiscal Year	Monthly Average
Total Samples Processed	5337	445
Total Analyses Performed	117014	9752
- EDXRF	94028	7836
- WDXRF	2294	191
- IC	18084	1507
- AA	70	6
- HGAA	29	2
- TECH	2503	209
- SIE	0	0
- GRAV	0	0
- OTH	6	1

Note: *This table does not include calibration, standards or QA/QC samples analyzed, unless reported to the customer.*

Legend:

EDXRF = Energy Dispersive X-Ray Fluorescence
WDXRF = Wavelength Dispersive X-Ray Fluorescence
TECH = Technicon Automated Colorimetry
HGAA = Graphite Furnace AA
OTH = Other
IC = Ion Chromatography
AA = Atomic Absorption
SIE = Specific Ion Electrode
GRAV = Gravimetric

QA/QC Activities (FPACAQ) 3200-67700

Project Manager: B. McDonnell (998-3671)

Objective

To design and administer an interlaboratory testing program, by supplying samples, standard reference materials, analytical methods and advice to laboratories of the Federal-Provincial Advisory Committee on Air Quality (FPACAQ) as well as to commercial and academic laboratories.

To provide advice to other national and international agencies concerning the availability of standard reference materials for use in environmental analysis, and to assist in the development and evaluation of QA protocols for EP administered contracts and methods.

Relevance

In order to improve and document the reliability of environmental measurements, quantitative measures of laboratory performance are required. Interlaboratory studies yield sufficient data to allow statistically valid performance standards to be established for analytical work.

Work Plan

701 Complete round robin and analytical report for survey on As, Cd, and Pb, in Noranada smelter dust.

702 Complete round robin and analytical report for sulfate/nitrate in solution and filter strips.

703 Complete a round robin for PAH in oil.

704 Complete a round robin for sulfate and nitrate.

705 Attend annual meeting of FPACAQ, report on round robins and prepare a report on meeting to management.

706 Technical advice and support. Provide advice on analytical methods, data interpretation etc. to participants in round robin studies.

707 Contribute to ISO/REMCO and other organizations as requested.

Status Report - March 31, 1990

701 Project completed.

702 Work has restarted on the final version of the analytical report for five air anions and lead.

703 No activity.

704 No activity.

705 A Summary of recent interlaboratory testing activities was prepared for presentation by the FPACAQ secretary Dr. John Hilborn at the annual meeting in Vancouver.

706 a) A review of the FPACAQ interlaboratory testing program has been completed for the Director of RRETC.

b) Background literature was provided to the Director to assist in defining control limits for the pulp and paper mill effluent Dioxin/Furan Draft Regulations.

Management 2200-67750

Project Manager: M. Bumbaco (998-3671)

Objective

Management of the financial and human resources of the Division and development and implementation of policies to ensure safe and productive laboratory operations.

Relevance

Requests for support and advice on complex analytical procedures originate from various C&P RCs as well as other government departments, national and international agencies. Such support is of major significance in our laboratory because of the increasingly high profile and attention being focussed on toxic chemicals in the environment.

Work Plan

751 Provide direction and manage human and fiscal resources of the Chemistry Division.

752 Plan and direct expenditures necessary to maintain CD lab operations including travel funds, equipment maintenance and repair, service contracts, contracted help, capital purchases and other administrative costs.

753 Prepare regular reports on Divisional activities, develop work plans and provide inputs to RRETC communications plan and other planning processes, as required.

754 Continue to implement a Lab Safety Plan for the Division, continue routine analysis of solvent wastes and provide technical assistance in the development of a comprehensive chemical and waste management plan for RRETC.

755 Undertake a program review to clarify the linkages, role and function of the FPACAQ QA/QC program in CD.

756 Continue participation in meetings and programs of C&P Lab Managers' Committee.

757 Participate as a member of CGCSB committee on Petroleum test methods.

Status Report - March 31, 1990

751 a) All classification and staffing actions for the reorganized Division structure were completed and we succeeded in achieving most of the classification levels we requested. All acting staff were confirmed in their positions and a new research scientist was hired under the Departmental RES recruitment program. An offer was made for a CH-3 position in the Mass Spec unit but the successful candidate accepted another position with NH&W in Vancouver. A number of new term employees were hired and this has helped considerably in easing the problems of continuity of expertise in the High Hazard laboratory.

b) M. Bumbaco was absent from the Division for a period of six months while on full-time immersion French language training. During his absence, the duties of Division chief were very capably executed by Mr. Chung Chiu and Dr. Joe Dlouhy.

752 a) As in previous years, the Division's A-Base budgets were expended within the first three months of the year.

b) The A-Base budgets for the Division are too low (200K O&M, 100K capital) requiring a significant amount of resources and

energy to be spent on seeking ways to make up the shortfalls. The Division typically expends 700-800K O&M annually.

c) A complete overhaul and reconstruction of the H/H lab facility was planned and the design and implementation process begun with DPW. Consultant studies and pre-construction design plans were completed and construction will begin in FY 90/91, pending the availability of funds. Estimated costs for this major facility up-grading project are $800K.

753 a) Annual activity report was completed.

b) Work-plans were developed for the Division.

c) Input was provided to communication plans, conference plans, the bridge funding exercise, Green Plan, national lab review, laboratory audit exercise, and many other similar externally - requested and controlled administrative/bureaucratic programs and reviews.

d) Comments, advice and Divisional position and perspective were provided to a number of queries to the lab.

- a proposal by Envirocat on the development of a robotic system for automated preparation of environmental samples.
- an invitation to join a joint government/industry workshop on asbestos reference methods.
- a proposal for a training program to be designed for CEPA inspectors investigating secondary lead smelters.
- a briefing and lab tour for a delegation of environmental officials from India.
- a proposal from Ecologic on the development of full analytical systems for preparation and analysis of PCDD/F.
- a request for pesticide analyses received from a contract analytical laboratory in Gujarit, India.
- a request from the government of Algeria for analysis of organics in industrial waste samples from their country.
- information on the availability and capability of Canadian contract labs for PCDD/F, requested by TV Ontario's Science Edition.
- comments on the infrastructure required for credible dioxin analysis, requested by the Manager, Western Industrial Laboratories, Edmonton.

- information and advice on dioxin analyses requested by the Environmental Protection Authority, Melbourne Australia.
- a proposal from EMR, CANMET regarding the preparation of a reference material for sulphur analysis.
- information on Canadian contract labs experienced in PCB analyses, requested by McClellan/Daugherty Ltd.
- technical review and comments on CSA Report Z201-M89 dealing with PCB and PCDD/F analytical methods.
- comments on available Canadian contract labs experienced in PCDD/F analysis of Pulp Mill matrices, requested by Crestbrook Forest Industries, Cranbrook B.C.
- comments and an analytical report on PCB in printing inks, requested by the Chief counsellor, Federal Business Development Branch, Ottawa.
- comments on project B-3-361 PPRIC relating to the purchase of High Resolution GC/MS equipment and associated grant application, requested by Bureau Conjoint d'Evaluation des Programmes, Canada - Quebec Entente Auxiliare Sur la Developpement Scientifique, Montréal.

754 a) A comprehensive "Lab Safety Check-List" was developed and audit inspections of the laboratories were completed. Summary and detailed reports are in preparation.

b) Mandatory training program in lab safety procedures were put in place for all new staff (contractors, students, etc) in the Division.

c) Input was provided to the development and review of the RRETC Emergency Response Manual.

d) R. Thomas continued as Divisional representative on the RRETC Health and Safety Committee.

e) WHMIS labelling and other requirements were completed on the majority of the chemicals housed in the various laboratories. This remains an ongoing activity.

f) A cross-section of staff and contract personnel in the Division were interviewed as part of the Laboratory Audit. Information & comment were provided to consultants carrying out the study.

g) Annual medical examinations of all staff continues and contract employees are now included in this program.

h) Routine analysis of all solvents wastes before disposal and storage on site of PCB and PCDD/F-suspected solid wastes continues.

i) Ron Halman continued his part time duties (20% of his time) as chemical waste coordinator for the centre. As such he served as a source of technical & analytical expertise on all matters relating to waste generation, documentation, storage and disposal for all Divisions in the Centre.

j) A total of 8 Divisional employees received training in the correct use of fire extinguishers from Gloucester Fire department.

k) A training seminar on use of respirators in laboratory operational or emergency situations was attended by 10 staff/contractor/students.

755 A review of the role & function of the FPACAQ program was initiated by the Director, RRETC. Information was assembled by B. McDonnell and reported to D. Thornton. Comments on two draft reports were provided by Chief, Chem. Division and by Chief, Pollution Measurement Division.

756 Annual C&P LMC meetings in June & December were attended by C. Chiu, replacing M. Bumbaco. Information on CD's operation status, especially the QA/QC activities and the Hi-Res MS capability, was presented to the Committee. At the request of the Committee, a strategy report and a contract specification for the Development of Operational Strategies for an Approach to Treasury Board were prepared and submitted.

757 Dr. J. Dlouhy provided comments on a proposed CGSB method for hydrocarbons in automotive fuels.

Environmental Emergencies Technology Division

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Effects 41

Spill Countermeasures - Engineering 42

Spill Countermeasures - Chemistry & Physics 46

Services 3400-67449

Project Manager: K. Meikle (998-9622)

Objectives

Provide specialist technical advice and assistance on request; promulgate research and development results effectively; identify departmental and national technology development needs pertaining to spill countermeasures and establish priorities; and plan work and manage resources effectively.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, a geographical area, resource, or similar focus of attention.

Work Plan

Services to clients by responding to requests for advice, comments, information, and on-site assistance; planning and progress reporting; management committee and technical working group meetings; technical workshops and seminars; serving on the program committee for Response '89; the ESRF Program Study Committee for Oil Spill Research and Countermeasures, and the ASTM Oil and Hazardous Materials Committee; participating in Globe '90; and reporting study results by various means including the Spill Countermeausres Technology Newsletter and Spill Technology Fact Sheets.

Status Report - March 31, 1991

a) Provided advice and/or lab support concerning the following emergency incidents:

- EXXON VALDEZ oil spill in Alaska (oil properties and behaviour, shoreline cleanup)
- Sodium Hydroxide Spill in Quebec
- Mixed Solvent Spill in New Brunswick
- Dry Cleaning Fluid Spill in St. John, New Brunswick

- Diesel Fuel Spill in Northern Manitoba
- Diesel fuel Spill near Baker Lake
- NESTUCCA Oil Spill in B.C. (fate and effects)
- Hagersville Tire Fire (Remediation)

b) Provided on-site advice, and/or specialized hazard-level monitoring assistance, and/or clean-up assistance using prototype technology at the following incidents:

- EXXON VALDEZ oil spill in Alaska (assistance regarding shoreline cleanup - G. Sergy); dispersant use decision making and remote sensing - M. Fingas)
- Hagersville Tire Fire (air sampling - M. Fingas)
- KOMARG oil spill near St. John, New Brunswick (aerial remote sensing - M. Fingas)

c) Co-ordinated the development of eight joint-project agreements with the U.S. Minerals Management Service (US MMS) through which $172,000 (U.S.) were transferred to EETD, and the American Petroleum Institute agreed to transfer an additional almost $600,000.

d) A paper entitled "AMOP - The Arctic and Marine Oilspill Program" was prepared and submitted for the Proceedings of the 16th Canadian Petroleum Association Fairmont Workshop ("Getting It To Market).

e) The 12th AMOP Seminar (June 6-8) and the 6th Technical Seminar on Chemical Spills (June 5-6) were held in Calgary.

f) The manuscripts for 6 EE-Series Reports, the Proceedings of the AMOP and TSCS Seminars, and volumes 14(2), 14(3), 14(4), and 15(1) of the Spill Technology Newsletter were forwarded for printing.

g) M. Fingas was a keynote speaker at a workshop convened by the USMMS to determine research needs for oil spill response and to summarize progress to date.

h) M. Fingas participated in the ASTM F-20 Committee meeting in Clearwater on October 10-12 and another in Phoenix on February 20-11.

i) M. Fingas presented the results of the new work on beach cleanup chemicals at workshops in Alaska in November and in Washington in December.

j) M. Fingas was invited to make presentations on spill technology for a U.S. Congress review of oil spill preparedness. Two presentations were made in Washington.

k) M. Fingas was invited by senior U.S. government and oil industry officials to make a presentation on dispersant use and R&D in Washington in December.

l) M. Fingas made presentations on Spill Modelling, Analytical Techniques, and Spill-Treating agents to NATO/CCMS in Brest, France, in September. He was elected to chair the international committee on Spill Analytical and Remote Sensing Technology.

m) Tasks and priorities for FY 90/91 were established following meetings of technical working groups and consultations with clients and collaborators.

n) H Whittaker served as the Environment Liaison Officer to the Public Review Panel on Tanker Safety and Marine Spills Response Capability which was announced by the Prime Minister in June.

o) Two Branch Fact Sheets were completed, entitled Arctic and Marine Oil Spills and Chemical Spill Response.

p) G. Sergy manned the Emergencies Technology Booth and Display at Globe '90 in March in Vancouver.

q) G. Sergy was invited to the Exxon Valdez Cleanup Technology Workshop to make a presentation on his site observations and new spill cleanup research efforts.

r) G. Sergy was invited to make a presentation on the AMOP Program at the BC Oilspill Prevention Workshop in September.

s) K. Meikle, G. Sergy, and M. Fingas were invited to participate in the ESRF Forum on Oilspill Research in March.

t) The Section Head, Harry Whittaker, was seconded to the Public Review Panel on Tanker Safety and Marine Spills Response Capability full-time from July 1, 1989 to February 28, 1990, and part-time in March 1990. Lisa Keller carried out the duties of Section Head during that period.

u) Harry Whittaker was elected chairman of the ASTM Committee F-20 on Hazardous Substances and Oil Spill Response. He chaired the February 20-23, 1990 meeting in Scottsdale, Arizona.

v) Harry Whittaker served as chairman for the Environmental and Waste Separations Session at the Second International Conference on Separations Science and Technology at Hamilton, Ontario on October 1-4, 1989. Lisa Keller and Monique Punt presented papers at that conference.

w) Monique Punt and Harry Whittaker attended the June 4, 1989 Prairie Regional Oil Spill Containment and Recovery Assessment Committee, Research and Development sub-committee meeting in Calgary, Alberta.

x) Monique Punt attended meetings of the GASReP Excavate and Treat Sub-committee on September 20, 1989 in Ottawa, and on January 24, 1990 in Vancouver.

y) Lisa Keller attended meetings of the GASReP Pump and Treat Sub-committee on October 24, 1989 in Burlington, and on May 2, 1990 in Burlington.

Effects 3400-67499

Project Manager: G. Sergy (403-468-8039)

Objectives

Determine the environmental effects (and fate) of substances spilled or likely to be spilled; develop and evaluate spill response countermeasures and decision tools using environmental criteria.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource of similar focus of attention.

Work Plan

1. *BIOS Project.* Re-monitor and re-survey the oiled beach at Cape Hatt, NWT and prepare and publish a summary interpretation of 9 years observations on beached oil fate in the Arctic.

2. *Spill Treating Agents.* Test chemical dispersants according to EP guideline protocols, in order to determine compliance to prescribed Environment Canada criteria. Test other spill treating agents for toxicity to support guideline development and to assess environmental hazard.

3. *Spill Substance Testing.* Obtain and assemble toxicity data (EP battery of tests) on selected chemicals from the new (1989) spill substance priority list, to support spill manual updates, assess hazard, establish response priorities, etc.

4. *Lancaster Sound Atlas.* Co-fund and participate in the UP to develop an interactive computerized environmental atlas.

5. *Ecotoxicity Database.* Enter 12 years of historical RRETC ecotoxicity testing data into the computerized database.

6. *Pacific Coast Oilspill Project.* Complete the general plan for research to address deficiencies in knowledge and countermeasures for spill response on the West Coast.

7. *Effects Book.* Re-draft the existing text and incorporate new material.

Status Report - March 31, 1990

1. Field survey and analysis completed. Draft report prepared.

2. Completed testing on 26 products including dispersants, surfactants, bilge cleaners, solidifiers, surface cleaners, bioremediation agents.

3. Tested 5 substances on the spill priority list which had no toxicity data. Compiled LC50's on 1200 substances for use in re-evaluation of priority.

4. Year 1 of the multi-year project completed as planned.

5. Completed.

6. Scoping document complete and published.

7. One redraft complete. Further work is required. Still awaiting material from Exxon Valdez and Canadian spill statistics.

Spill Countermeasures - Engineering 4100-67539

Project Manager: H. Whittaker (991-1842)

Objectives

To develop, evaluate and demonstrate technology for combatting oil and chemical spills and for treatment of chemical spills and for treatment of chemical landfill leachate.

Relevance

Supports the departmental objective of environmental protection by ameliorating the effects of spills and leachates.

Work Plans - Task 500

500 Maintain laboratory facilities and demonstration equipment.

501-2 Depending upon CCG's priorities, partially fund either an evaluation of the new Wartsilla skimmer for ice-congested waters or the development of Navenco's Spiliner.

504 Complete Phase II (pilot plant study of supercritical solvent extraction using butane) as initiated in FY87/88 by an unsolicited proposal.

505 Test the prototype steam stripper at the Gloucester landfill or other suitable field site, possibly in co-operation with WTC or US EPA.

507 Complete construction of a prototype Pervaporation Unit as initiated in FY 87/88 by an unsolicited proposal.

508 Ascertain the feasibility of a Canadian alternative to the non-operational OHMSETT facility under a joint project agreement with US MMS. (Commenced in FY 88/89).

510 Demonstrate microfiltration/ultrafiltration, reverse osmosis and granular activated carbon technology in the Atlantic Region. (Deferred in FY 88/89 for lack of resources).

511 Evaluate air jet and electronic transducers for oil atomization and the efficiency of burning the atomized oil in the prototype ultrasonic burner.

512 Confirm the 1988 tank experiment indications by a field evaluation of the water jet barrier in the containment mode in a current, including its performance as a fireproof boom.

514 Test at least 6 products introduced since the 1982/83 Sorbent Update III with oil and evaluate chemical compatibility of selected products.

515 Jointly with IPB and WTC, partially fund an unsolicited proposal for a small pilot-plant evaluation of electrochemical oxidation for removing chlorinated organics from groundwater.

516 Investigate the possibility of controlling the laser beams of the Laser Ignition Oil Spill (LIOS) system by the use of a dual mirror arrangement and a video tracker under an agreed joint project with the US MMS. (Initiated in FY 88/89.)

517 Modify existing technology as required and build a mobile UV photolysis unit for treating spill-contaminated water.

Operate the unit at the Gloucester landfill or other suitable field site as determined by prior laboratory test, possibly in co-operation with the WTC or the US EPA.

500 a) The mobile RO unit was given a refit in March. Several improvements were incorporated at that time.

b) Major pieces of equipment were moved to a warehouse in Gatineau for improved protection against winter degradation.

501-502 The CCG did not commence either project. No work could be done on the Wartsilla skimmer at this time and insufficient funding was available to support the Naveco Spilinger UP. Funding allocated was switched to task 500.

504 The Study has been completed. Use of a co-solvent for removal of polar organics was included. The 5-10 litre/hour prototype used for this testing was delivered to EETD. A final report was received and will be published in the EE series once the issue of patent has been resolved. The contractor reported on this work at the June 1990 Technical Seminar on Chemical Spills.

505 The steam stripper was displayed at the June 1989 Technical Seminar on Chemical Spills. Due to work-load constraints, testing was postponed until FY 90/91. Remaining funding was re-allocated to Task 500.

507 The prototype was completed and tested. Final test results were ambiguous. The unit was loaned to Wastewater Technology Centre, for one year, for use in their membrane development project. A final report on the construction and operation of the unit was received.

508 The final report has been received. It concluded that although there was no one facility in Canada which could duplicate the capabilities of OHMSETT there are two facilities in which to carry out significant test programs at moderate cost.

It has now been decided to revitalize the OHMSETT facility. No further work in this area is anticipated.

510 Three sites in Atlantic Canada were visited during October and November 1989. Microfiltration (MF) and Reverse osmosis (RO) were demonstrated at each site and nanofiltration (NF) was tested at two of the sites. The New Brunswick Department of the Environment requested a demonstration of EETD's enhanced oxidation unit for the water contaminated with diesel and gasoline. The results indicated membrane technology successfully separated chemical constituents of concern at each of the three sites during the demonstration. Rejections of 95% were consistently achieved. The rejection of PCP at Domtar was excellent at +99.9% showing that membranes can effectively separate problem organics from groundwater at this site. Preliminary results for the UV/Oxidation unit produced +95% destruction of the BTX contained in the fuel-contaminated groundwater at Neguac. A successful integration of

membrane technology and UV/Oxidation systems was demonstrated at Neguac.

A joint demonstration, on aqueous porcine effluents, was carried out in conjunction with Seprotech Inc. and Pluritec Inc. for Environment Quebec. The results indicated that the combination of Nanofiltration (NF) and Reverse Osmosis (RO) showed promise for reducing the volume of discharges from the pork farming industry while producing a useful product.

511 A laboratory scale evaluation demonstrated that the air jets were effective in atomizing oil. The electronic transducers were faulty.

The prototype ultrasonic burner burned the atomized oil without producing black smoke. The effect of waves on burning efficiency was not investigated.

The final report was received and will be published in the EE series.

512 A test was carried out at Prescott, Ontario in conjunction with the Canadian Coast Guard. Problems were encountered in maneuvering the barrier in the current in large part due to the drag of the hoses and floats. A planned burn trial was cancelled as a result.

It was decided to thoroughly re-evaluate the barrier float system and configuration before carrying out any further trials with the waterjet barrier.

The 1989 trial report will be published in the Spill Technology Newsletter.

514 Sixteen commercially available oil spill sorbents (organic and synthetic) were tested in three different petroleum products and two hydrocarbon solvents. Some of the test liquids were aged for periods of one and seven days. The sorbents were evaluated in terms of initial and maximum capacities, water pickup and reuse potential.

The synthetic sorbents generally exhibited higher capacities and potential for reuse than the organic sorbents. Lower sorbent capacities and higher water pickup were observed with decreasing test liquid layer thickness.

An EPS series report is in preparation.

515 The UP fund was discontinued in the Budget and the planned project did not proceed.

516 The project was successfully completed and the design of a pointing and tracking system produced.

The final report will be published in the EE series.

517 The unit was built by Solarchem and tested at the New Brunswick Department of the Environment site at Neguac, New Brunswick (See Task 510). It was then loaned to the builder for field tests in Anne Arbour, Michigan and Freehold, New Jersey. Both trials were very successful.

Spill Countermeasures - Chemistry and Physics 4100-67599

Project Manager: M.F. Fingas (998-9622)

Objective

To determine the cold-climate properties and behaviour of spilled substances and the effectiveness of spill-treating agents.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plans

550 Maintain spill-response equipment in readiness for emergency deployment and keep laboratory facilities ready to provide support.

551 Attend as an observer at the large French chemical fate and behaviour offshore experiment originally scheduled for June 1989.

553 Continue development of portable (Level 2) field analytical methods for organic substances in soil and water.

554 Continue work in-house on dispersant formulation improvements and effectiveness test methods.

555 To develop a new fluorosensor for oil in water and oil on water.

556 Continue to expand the library of identifiable substances in the Level 3 mobile field analytical system and demonstrate its capability.

557 Deliver the completed manuscript for the PCB EnviroTIPS manual.

558 Produce a preliminary draft of guidelines for the use of oil spill treating agents including oil dispersants.

559 Participate in a joint project with U.S. Minerals Management Service to study oil burning as a spill countermeasure.

560 Give one training course on the use of field analytical equipment and the associated personal protection equipment; and continue the scheduled replacement of worn-out personal protection equipment.

561 Deliver the completed manuscript for the basic manual "An Introduction to Hazardous Materials Spills".

562 Continue work on the production of an expanded Manual for Spills of Hazardous Materials including another section containing less comprehensive information on at least 5,000 additional substances.

563 Study the formation of water-in-oil emulsion - a joint project with U.S. Minerals Management Service.

566 Survey potential in-situ treating agents for contaminated soil and evaluate selected agents in the laboratory.

567 Continue the joint project with the US MMS to acquire an understanding of how photo-oxidation affects oil properties and behaviour.

568 Partially fund and oversee a multi-year study by the U. of Calgary (Prof. R. Rowe) to determine the effect of subsea blowout orifice size on oil droplet size.

569 Compile a catalogue of safety equipment suitable for spill situations.

570 Test selected new analytical devices that appear to have potential for field use in spill situations.

571 Review and extend previous work on the behaviour of spilled oil under first-year ice. (Year 1 of a 2-year extension of a NOGAP project).

572 Continue to serve as an invited member of the review committee for the project to update the USCG HACS.

573 Improve the modelling capability for soil penetration by spilled substances by partially supporting ongoing work at the U. of Waterloo or by undertaking a review of what has been learned.

574 Continue to investigate the fate and behaviour of heavy and submerged/overwashed oils at laboratory scale as a continuation of the FY88/89 joint project with the US MMS.

575 Develop an oil slick thickness sensor in conjunction with Esso Resources and the U.S. Minerals Management Service.

Status Report - March 31, 1990

550 a) The damage sustained by the towed fluorometer during the 1986 Beaufort Sea dispersant trial has been repaired, several improvements to the unit were completed.

b) Several sampling and test kits were prepared.

551 The funds were used to attend a CCMS/NATO meeting where a report on the trials was presented.

553 Contract awarded to Counterspil Research Inc. A report on over 70 methods for quantifying spilled compounds in soil and water was published as well as a survey of portable analytical instruments.

554 Work was done in-house using contract personnel. A paper describing the results was presented at the AMOP seminar. This study was cooperative with the U.S. Minerals Management Service.

555 This is a joint program with PERD, Fisheries and U.S. Minerals Management Service. A contract was let to Barringer Research who had originally submitted an unsolicited proposal. The first year of work to construct a bench unit was completed and a report prepared.

556 Contract was awarded to S.L. Ross with R. O'Brien performing the work. A new GC-MSD was installed in the van.

557 No changes were required by the reviewers of the draft manual, but a number of important deficiencies were identified during the response to the St. Basile-le-Grand incident and revisions will be delayed pending the availability of external funding.

558 Contract to develop effectiveness tests was awarded to R.S. Scientific, Ottawa. Guideline needs have been tabulated, a test for surface washing agents has been developed, and performance data have been obtained for 15 such agents. A draft outline of the guideline was produced.

559 A contract was let to D.F. Dickins Associates Ltd. to begin planning for the major burn experiments. Samples from test burns were analyzed by CD using GC-MS on behalf of EETD.

560 In the continued absence of requirements set by any other departmental or national authority, EETD prescribed its own training requirements for staff issued with personal protection equipment by EETD. Two sets of courses were given to a total of about 25 people.

561 Unsatisfactory chapters of the first draft of the manuscript must be rewritten. Task deferred to next year because of lack of funds

562 Data collection contracted to Consultchem. Data collection for 3,500 of the 5,000 compounds was completed.

563 Contract was awarded to Consultchem. A report was completed and presented at this year's AMOP seminar.

566 Deferred for lack of resources.

567 Contract awarded to Consultchem near the end of the year. The experimental work will be done in-house using the unique EETD facilities.

568 Second year results were reported at the AMOP seminar. A third-year contract has been awarded and the work is in progress.

569 EETD's collection of product brochures has been overhauled and put into a computerized data base. A catalogue of over 50 safety devices has been compiled and 17 are currently under review.

570 Five devices were tested and a draft report prepared.

571 Deferred pending receipt of NOGAP funding.

572 No meeting was convened during the reporting period, but several papers were reviewed.

573 Deferred for lack of resources.

574 Contracts were awarded to Consultchem and DMER respectively to determine the properties of specified heavy oils and to further investigate property changes in submerged/overwashed oils. The Consultchem data have been incorporated into the revised oil properties catalogue and a draft report has been received from DMER. The latter contract focussed on the evaluation of the long-term weathering of submerged oils.

575 Two separate concepts of slick thickness determination were investigated by IMRI in Boucherville, Quebec. The most promising is a thermoelastic detection system using 2 lasers. Two draft reports have been prepared.

Pollution Measurement Division

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NAPS Network Operations 3200-67201

Project Manager: P. Brunet (991-9460)

Objective

Co-ordination of the National Air Pollution Surveillance (NAPS) Network for the measurement of ambient air quality in major urban centres and other areas of concern in Canada.

Relevance

Information on fluctuating ambient air levels of contaminants is essential for the identification and assessment of air pollution problems as well as for the development and evaluation of the effectiveness of control strategies.

Work Plan

1. Assist provincial agencies in the operation and maintenance of NAPS stations.
2. Procure, verify and distribute 25 replacement continuous analyzers.
3. Procure, verify and distribute 100 zero and span gas cylinders.
4. Process TSP and IP filters and COH tapes for sampling.
5. Maintain network equipment inventory and site documentation databases.
6. Plan and organize 3rd Federal/Provincial Technical Workshop in Vancouver, B.C.
7. Publish revised edition of the Site Documentation Manual.
8. NAPS display to be exhibited at APCA International Meeting, Globe 90, Environment Week and in NCA.

Status Report - March 31, 1990

1. Technical assistance in the operation and maintenance of NAPS stations across Canada was provided to provincial and municipal network agencies in trouble-shooting problems with ambient air analyzers, providing replacement parts, consumables and maintenance kits and repairing instruments and calibrating equipment and peripherals.

2. For the NAPS instrument replacement program, 2 new CO (TECO 48) analyzers, 8 ozone (ML 8810) analyzers and 8 multi-point hybrid recorders were provided to the field. In addition, 4 NO_x monitors were modified with IZS systems, 2 ML8850, 2 ozone Dasibi were overhauled and returned to the field.

3. In support of the NAPS network, 60 NO span cylinders, 12 CO span cylinders, 17 NO, and 8 CO calibration cylinders were certified and supplied to NAPS agencies. A number of gaseous and particulate monitoring instruments were calibrated in the lab.

4. Particulate filters were supplied to a number of NAPS agencies in support of the measurement of total suspended particulates, inhalable particulates, lead, sulphate and nitrate. These filters include those for regular hi-volume particulate samplers, size selective inlet particulate samplers and dichotomous particulate samplers. Exposed filters from July 1988 to December 1989 have been processed and forwarded to the Chemistry Division for chemical analysis. Dichotomous samplers are continuously being overhauled, calibrated and exchanged to ensure proper functioning. Multi-element data for dichotomous filter samples were received from the Chemistry Division.

5. The network equipment database was maintained and an updated inventory was sent to all agencies. The instrument inventory was updated and sent to provincial agencies.

6. A third NAPS Technical Manager's Meeting was organized in Vancouver with participation of various members of the Ambient Section. A summary report was prepared and distributed to participants.

7. A revised edition of the NAPS Site Documentation Manual was published in March 1989 with updated data for Class 1 and Class 2 stations to January 1988.

8. The NAPS display was completely redesigned and rebuilt and exhibited at the GLOBE90 international exhibition. Current station data were loaded in files for display of current network data. Slides on pollution trends were prepared for the exhibition.

NAPS Network Data Processing 3200-67202

Project Manager: P. Brunet (991-9460)

Objective

Process, validate, interpret and prepare summary reports on ambient air quality in major urban centres and other areas of concern in Canada.

Relevance

Information on fluctuating ambient air levels of contaminants is essential for the identification and assessment of air pollution problems as well as for the development and evaluation of the effectiveness of control strategies.

Work Plan

1. Compile, validate and publish 12 monthly data summaries.
2. Compile, validate and publish 1 annual data summary.
3. Compile, validate and publish special data reports - including inhalable particulates, SO_4, heavy metals.
4. Input all inhalable particulates, metal and organic data into the NAPS database.
5. Prepare data reporting procedures for generating special data reports using new Model 204 data base.
6. Incorporate data from non-NAPS ozone and NO_x stations.
7. Initiate on-line access of data base by users.

Status Report - March 31, 1990

1. NAPS network air quality data were collected and processed for publication. Monthly NAPS reports from August 1988 to July 1989 have been validated and sent for publication.
2. The 1988 annual NAPS report was published on time.
3. Ozone data tape and station information was prepared and sent to Dr. A. Lefohn, Montana. Requests for annual and monthly summaries were processed.
4. Since December 1989, a contractor has been working on the NAPS M204 data base; all historical data from 1974 to present have been uploaded; data loading and validation programs have been developed; the record format of the data base has been improved; work will continue into next fiscal year.
5. A contractor was hired to write reporting procedures for special reports.
6. At the NAPS Technical meeting in Vancouver in May 1989, all agencies were requested to send their non-NAPS ozone and NO_x data. A contract was hired to write data base procedures.

7. Air monitoring data from recorder strip charts, for the Ottawa-Hull station (updated to the end of February 1989) were digitized. Effective January 1989, the data from Hull station will be collected, retrieved and updated to the NAPS data base by using the SUMX data-logger and an IBM/PC. The strip charts will be used as a backup for the system. A Telog system was also installed in this station as part of the field evaluation and comparison system.

NAPS Quality Assurance Program 3200-67203

Project Manager: P. Brunet (991-9460)

Objective

Review, update and continue implementation of a comprehensive quality assurance program for the National Air Pollution Surveillance Network.

Relevance

Important and far-reaching decisions are based on air quality data. Data may be used to determine attainment of air quality standards, the feasibility of plant expansions or process changes, the necessity of air pollution control device installation, in directing the future growth of industrial areas, and could serve as evidence in courts of law. With current emphasis on legal action and social pressures to abate pollution, it is essential that air quality data accurately represent ambient air conditions.

Work Plan

1. Prepare sections of the NAPS quality assurance manual.
2. Implement recommendations from the 3rd Federal/Provincial Technical Workshop.
3. Carry out acceptance testing on NAPS replacement analyzers.
4. Conduct inter-laboratory tests of selected gases.
5. Conduct 5-15 station performance audits.
6. Conduct a series of NAPS network review projects.

Status Report - March 31, 1990

1. Sections of the NAPS quality assurance manual (calibrations and audit procedures for SO_2 and NO_x and operations and maintenance procedures for O_3 were prepared and are ready for publication.

2. A report summary of the 3rd NAPS Federal / Provincial Technical Workshop was prepared and distributed to the participants. Plans for the expansion of inhalable particulate monitoring in the network were delayed pending the adoption of a national air quality objective by the FPACAQ sub-committee. Following a recommendation, some changes in NAPS data trends reporting methods were discussed for implementation in the next air quality trends report. A specific recommendation directed at the FPACAQ was not implemented since the status of the committee is pending.

3. For the NAPS instrument replacement program, 2 new CO (TECO 48) analyzers, 8 ozone (ML 8810) analyzers and 8 multi-point hybrid recorders were acceptance tested and sent to the field. In addition, 4 NO_x monitors were modified with IZS systems, 2 ML 8850, 2 ozone Dasibi were overhauled and returned to the field.

4. The third round robin was initiated and some of the results were already returned.

5. Seven NAPS stations were audited (Ottawa, Nova Scotia, New Brunswick, Saskatchewan, Manitoba and Montreal). In support of the NAPS network calibration program various analyzers, field calibrators, dichotomous samplers and orifice kits were calibrated for an EPA round robin program, provincial agencies, federal departments and others. Reference standards for ozone, temperature, voltage, and flow meters were correlated to primary standards.

6. Groundwork for the NAPS Technicians Meeting scheduled for July 1990, in Halifax was completed. A survey of quality assurance activities of all agencies in the NAPS network was completed and a summary was sent for discussion at the NAPS Technical Seminar in Halifax.

NEW

7. Ozone monitors were calibrated for Health and Welfare Canada, and MOE Quebec. Eight permeation tubes were calibrated for MOE Nova Scotia.

8. Field evaluations of a Xontech portable VOC sampler, an Environmental S.A. field calibrator, a beta gauge particulate monitor and a data acquisition system (Telog) were completed.

Special Ambient Air Monitoring Surveys 3200-67204

Project Manager: T. Dann (991-9459)

Objective

Planning and conducting air toxics monitoring surveys to provide the data required for assessment and control of the environmental impacts of toxic air contaminants.

Relevance

The assessment of the environmental significance of specific air pollutants, classes of pollutants or of source categories emitting pollutants requires a valid ambient air data base in order to assess population exposures to the contaminants of concern. The CEPA Priority Substances List, the assessment of the impact of the Detroit Incinerator on Canadian air quality and the NO_x/VOC control program are all examples of issues requiring ambient air monitoring information.

Work Plan

1. Monitoring and data assessment support for Detroit Incinerator toxics monitoring.
2. Assistance re monitoring to determine health effects of LRTAP pollutants. On-going.
3. Assistance re toxics/LRTAP pollutant measurement and data interpretation, as required (All regions). On-going.
4. Emergency type monitoring, as required.
5. VOC monitoring (data collection) at 12 urban locations. Vancouver (3); Montreal (2); Ottawa; Toronto (3); Hamilton, Sarnia, Windsor, Halifax, Walpole Island.
6. VOC monitoring to support AES Eulerian modeling project.
7. PAH monitoring at four sites (Toronto, Hamilton, Montreal, Arvida).

Status Report - March 31, 1990

1. In support of the C&P Ontario Region monitoring program for the Detroit incinerator, two monitoring stations are being operated in the Windsor area. These sites are measuring dioxins, furans, polycyclic aromatic hydrocarbons, PCB, chlorophenols, chlorobenzenes, volatile organic compounds, inhalable particulates and metallic elements. A data report was prepared which included all results for July 1987 to September 1988 and released in April 1990. A second report covering the period September 1988 to October 1989 is in final preparation.

2. Data on sulphates and nitrates were incorporated into the NAPS data base.

3. a) PAH and VOC samplers were provided to the Manitoba Department of Environment to assess impacts of field stubble burning. Analysis was also provided for VOC samples and assistance was provided for the design of the sampling program.

   b) Assistance was provided to Canadian Mortgage & Housing Corporation (CMHC) to carry out a survey of indoor air quality in houses built on a land fill site in Kitchener.

   c) Assistance was provided to the Wastewater Technology Centre (WTC), Burlington to carry out a survey of VOC emissions from wastewater treatment plants.

   d) Over a hundred requests for air toxics data from government and non-government agencies were filled. Data were provided for the toluene, xylene and benzene CEPA Priority Substances List (PSL) assessments.

   e) A number of reports were prepared and presentations made on various aspects of the air toxics monitoring program.

4. Support was given to Environmental Emergencies Technology Division (EETD) to assess the impact off the Hagersville tire fire. Two PAH samplers were assembled and calibrated for the survey. PMD staff were on site during the fire to operate the samplers.

5. Ambient air sampling for VOC is being carried out at sixteen urban sites across Canada. A total of 115 different species are being identified and quantified; these include toxics as well as photochemical oxidant precursors. Aldehyde/ketone sampling and analysis was added to five sites in November 1989.

6. Meetings were attended with AES, MOE and York University to finalize arrangements for participation in the Eulerian Model evaluation field study in rural central Ontario. PMD provided speciated HC measurements for two sites in Ontario. Sampling was carried out in March 1990 to April 30, 1990 and approximately 150 samples were collected and analyzed.

7. Ambient sampling for PAH is being carried out in four cities - Montreal, Jonquiere, Toronto and Hamilton in addition to the two Windsor area sites. Initial data summary reports were prepared.

Evaluation and Development of Ambient Air Measurement Technology 3200-67205

Project Manager: T. Dann (991-9459)

Objective

Development and evaluation of new ambient air pollution measurement technology to support priority issues such as Toxics, LRTAP and NAPS network. Developed measurement technology will be phased into the NAPS network as required.

Relevance

Because of the ever increasing list of air contaminants of concern, it is vital that effort be expended on development of ambient air measurement methods and on keeping up with developments in the field of air pollution monitoring technology. Efforts to develop and evaluate measurement methods for fine particulates and organic air pollutants have been undertaken in recognition of their priority in the Toxics and LRTAP issues.

Work Plan

1. Further develop and apply measurement technology for VOC (toxics and oxidant precursors) at sites in Ontario, Quebec and B.C.
2. Provide support and direction to CCME-sponsored ambient dioxin method development project.
3. Further development of ambient air sampling and analysis methods for incinerator-related toxics (metals, PAH, Dioxin/Furan, VOC).
4. Provide a summary of metal concentrations at Canadian sites and identify major sources.
5. Further develop and apply methodologies for characterizing VOC emissions (including benzene and formaldehyde) from vehicle exhaust.
6. Preparation of data assessment reports for O_3, NO_x, VOC to support NO_x/VOC action plan.

Status Report - March 31, 1990

1. a) A method of preparing multi-component VOC standards in ppt concentration ranges for instrument calibration was developed and standards were provided to a number of agencies.

   b) A commercial VOC sampler made by Xontech in California was evaluated.

   c) Pollution Measurement Division (PMD) is participating in a round robin study with the United States Environmental Protection Agency and ORTECH for formaldehyde analysis of standards and test samples.

   d) Two commercial VOC samplers purchased by the Greater Vancouver Regional District (GVRD) and the province of Newfoundland were sent to PMD for sampler blank certification. Both samplers failed the blank test. After modification and extensive cleaning in the laboratory, the samplers were certified and returned to the two monitoring agencies.

2. The third year work program for the Canadian Council of Ministers of the Environment (CCME) sponsored co-operative R&D project on ambient dioxin sampling and analysis was approved by the CCME parent committee. Activities included an inter-lab comparison involving six Canadian laboratories and a workshop hosted in Toronto which attracted 100 participants. Results of the work program were presented at the Dioxin '89 conference.

3. a) Operation and maintenance procedures for VOC and PAH sampling were prepared to assist field operators.

   b) Aldehyde sampling systems were designed and deployed in the field. Additional modifications were made to canister-based VOC sampling systems and to the PAH/dioxin samplers.

4. A report summarizing PM_{10} and metal concentrations for Canadian urban monitoring sites for the period 1984-1987 was prepared and distributed.

5. Advice and assistance on the sampling and analysis of VOC for the Vehicle Emission Testing Laboratory (VETL) test program was provided. Over 300 exhaust and evaporative emission samples were analyzed for VOC species. Collaborative analysis of VOC data was begun.

6. a) There was extensive involvement in the development of the NO_X/VOC Management Plan for Canada and in the public consultation process supporting the plan. Activities included presentation at public information sessions, participation in multi-stakeholder workshops, participation in technical group

workshops, extensive data analysis re O_3, NO_x and VOC levels in Canada, reviewing technical comments submitted on drafts of the plan and writing a number of the sections of the plan.

b) An Economic Commission for Europe (ECE) negotiating session on the development of an international VOC protocol was attended in Geneva.

c) Presentations were made at a federal/provincial workshop aimed at improving and expanding the existing VOC/NO_x/O_3 monitoring network in Canada.

NEW

7. A detailed data report on PAH sampling and analysis in Toronto and Montreal was prepared and released.

8. A report on VOC speciation in ambient air and in emissions was prepared and distributed.

9. The evaluation report on the MDA beta-gauge continuous particulate measurement system was completed and distributed.

Source Measurement Technology Development 3200-67206

Project Manager: P.K. Leung (991-9456)

Objective

1. Develop and/or evaluate Reference Methods (RMs) in support of regulations/guidelines under CEPA.

2. Revise/update existing emission measurement methods to reflect changes in the art in both equipment and knowledge.

3. Develop new methods in response to emerging priority issues (eg. dioxins and other toxics).

4. Evaluate commercially available monitors capable of measuring stack emissions on a real-time basis.

5. Participate actively in technology transfer exercises.

Relevance

Reference methods, which are incorporated into national emission regulations/guidelines, specify the emission measurement procedures to be used to determine compliance. Continuous measurement systems provide emission data to control agencies over and above that required for compliance monitoring.

Work Plan

1. Update the following Reference Methods: (a) Mercury (Chlor-alkali plants); (b) Asbestos (Mining & Milling Operations); and (c) Vinyl Chloride (Manufacturing).

*2. Develop a Recommended Method for selected volatile organic compounds (VOCs) using the volatile organic sampling train (VOST).

*3. Develop a source measurement technology to monitor organic emissions on a real-time basis.

4. Prepare for a source measurement workshop in Ottawa (Winter 1989/90).

5. Other projects initiated during the review period.

* *Scope of these projects determined by availability of external funds.*

Status Report - March 31, 1990

1 a) *Mercury (Chlor-Alkali Plants).* At the request of the Industrial Programs Branch (IPB), Report EPS 1-AP-76-1 "*Standard Reference Method for Source Testing: Measurement of Emissions of Mercury from Mercury Cell Chlor-alkali Plants*", PMD 1976, was updated. Based on input from the Region, witnessing of field tests and a review of historical data, changes were made to maximize the quantitative capture of mercury in the sampling train. Final editing of the Reference Method (RM) is underway and the document is expected to be published in FY 1990/91.

b) *Asbestos (Mining and Milling Operations).* PMD chaired a joint federal/provincial/industry technical working group to address the industry's request to modify an existing asbestos RM. Meetings were held to establish the mandate of the working group, to identify issues, to understand the position of each party, and to negotiate and agree on a plan of action. Resources requirements were established and technical and financial responsibilities assigned. PMD provided the working group with a study proposal. Field testing is to start in mid 1990. The outcome of the study will determine whether the proposed screening method is acceptable and can be

incorporated into the CEPA regulations and whether the existing emission limit has to be adjusted to reflect any major changes to measurement methodologies.

c) *Vinyl Chloride (Manufacturing).* Preliminary meetings were held with IPB and industry to discuss updating of the existing RM. No major deficiencies were noted in the sampling section of the method. However, the analytical section will require some changes to reflect recent advances in gas chromatograph (GC) technology.

2. *Volatile Organic Compounds (VOCs).* Development work to evaluate a proposed method to measure VOC emissions continues. A study was conducted to determine the performance of a dual-detector GC for analyzing compounds on the CEPA Priority Substances List. The portable unit will be used as a field screening tool to determine the applicability of the VOST method on incinerators.

3. *Real-time Monitoring of Organic Emissions.* A study was conducted to develop a system to semi-quantitatively measure the concentrations of CEPA Priority Substances List compounds. The system was developed and tested using single- and multi-component mixtures. The accuracy and reproducibility of the prepared standards and the performance of the system were evaluated. The data collected were summarized and evaluated.

5. a) *Semi-Volatile Organic Compounds, Hydrogen Chloride, Carbon Monoxide, Total Reduced Sulphur, Lead and Particulates.* The RMs for these substances were either updated or developed by PMD in support of various CEPA regulations. Edited version of the first two documents were published and the remaining four will be officially released in 1990.

b) *Training of CEPA Inspectors.* A presentation was made at the Secondary Lead Smelter Regulation workshop to transfer source measurement technology to CEPA inspectors responsible for the compliance and enforcement of emission regulations. The inspectors were trained on the basics of sampling and on-site witnessing.

c) *Technology Transfer.* The following unedited documents were published to transfer source measurement technology to the users of the Environment Canada reference methods:

i) *Technical Assistance Bulletin (TAB).* The bulletin provides users with background information on reference methods, special sampling techniques, new methods, and other technical information related to source measurement. It will be published on an "as-required" basis.

ii) *Witnessing Forms.* The documents were developed for the auditing and witnessing of SVOC, particulate/metal, VOC and HCl emission testing. The forms will be useful to CEPA inspectors responsible for compliance and enforcement of emission standards.

iii) *Critical Orifice Calibration.* A technique for the construction, calibration and field application of critical orifices was developed and documented. Critical orifices are used by field auditors to verify dry gas meter coefficient.

(d) PMD staff serve on the American Society for Mechanical Engineers (ASME) PTC-45 Committee to develop a protocol for the testing of municipal solid wastes incinerators.

PMD staff chaired the Analysis Session of the joint EMR/EC Information Exchange Program in Ottawa and co-chaired the Sampling and Analysis Session of the International Conference on Municipal Wastes Combustion in Hollywood, Florida.

(f) An unsolicited proposal entitled "*Strategic Environmental and Process Assessment (SEPA) System*" was reviewed and comments were forwarded to IPB.

Source Emissions Evaluations 3200-67207

Project Manager: P.K. Leung (991-9456)

Objective

1. Measure emissions of selected air toxics from industrial sources in support of specific C&P responsibility centre programs (including compliance/enforcement actions) or in response to the needs of emerging priority issues (eg. dioxins and other toxics).

2. Participate in the planning and field implementation of source emissions evaluation programs initiated by other federal departments, provincial governments and private companies.

3. Co-operate with other C&P responsibility centres in determining compliance with CEPA emission regulations/guidelines.

Relevance

C&P is responsible for specifying regulations/guidelines limiting the emissions of specific substances. Often, it becomes necessary to measure emissions to (a) determine compliance and (b) assess emission impact and the effectiveness of control measures.

Work Plan

Conduct emissions measurement programs or provide technical advice/guidance and witnessing expertise in the evaluation of industrial sources (selection to be made during FY as priorities and resources are identified) such as:

*1. Hospital Waste Incinerators (Bio-medical Wastes Program).

*2. PCB Incinerators (Federal PCB Clean-up Program).

3. Hazardous Waste Incinerators (Sydney Coal Tar Remedial Program).

4. Cement Plants (St. Mary's Peerless Trial Burns Program).

5. Municipal Waste Incinerators (Detroit Compliance Testing Program).

6. Asbestos Mines (Baie Verte Compliance Testing Program).

7. Other projects initiated during the review period.

* *Scope of these projects determined by availability of external funds.*

Status Report - March 31, 1990

1. *Bio-medical Wastes Program.* The final report on the emission testing conducted at the DECOM bio-medical wastes incinerator in Gatineau was reviewed and comments were forwarded to the Quebec Ministry of the Environment via the Quebec Region. The tests had been witnessed by PMD.

2. *Federal PCB Wastes Clean-up Program.* Contribution of PMD to the PCB Incineration Project at Goose Bay include:

   a) *Project Planning.* PMD discussed the various aspects of an emission compliance testing program with officials from the Newfoundland District Office (NDO), the Waste Management Branch, the province, DND, and the general contractor, Proctor & Redfern. Technical advice on sampling/QA/QC protocols, priorities of process and emission parameters to be tested, cost estimates and other compliance testing concerns were provided.

b) *Auditing, QA/QC and On-site Witnessing.* A Source Sampling Audit Plan was written and provided to the project participants. Clean Air Engineering's compliance testing plan was reviewed and comments forwarded to the NDO CEPA inspector. Actual field auditing and witnessing were conducted at Goose Bay in January 1990. The test data were evaluated and the findings reported.

c) *Environment Canada Tests.* PMD provided the project participants with a Verification Plan and conducted a series of emission tests on the mobile incinerator. The emission samples were analyzed for particulates, PCBs, dioxins, furans, and HCl.

3. Hazardous Waste Incinerators. PMD continues to provide technical assistance to the Atlantic Region and the Nova Scotia Department of the Environment for the Sydney Coal Tar Remedial Program. Comments were made on the emission tests conducted on a pilot-scale revolving fluidized-bed incinerator at Super Burn Systems Ltd. in Vancouver. A plan was made for PMD to participate in the compliance testing of the commercial-scale Tar Ponds Incineration System to be installed at Sydney in late 1990.

4. *Cement Plants.* No external request for technical assistance was received for the St. Mary's Peerless Trial Burns Program.

5. *Detroit MSW Incinerator Compliance Testing Program.* Emission compliance testing of the incinerator was witnessed by a PMD representative. A witnessing report was prepared and forwarded to the Ontario Region.

6. *Asbestos Compliance Testing Program.* PMD provided stamped filters and technical advice on the preparation of filters to the consultant hired by Baie Verte.

7. a) *Vinyl Chloride Compliance Testing Program.* At the request of the Ontario Region, PMD witnessed compliance testing at the Dow Chemicals, the Esso Chemicals, and the B. F. Goodrich PVC/VC plants.

b) *Vehicle Emission Testing.* At the request of VETL, gaseous emission samples were analyzed for SO_2.

c) *SYSCO Phase II Modernization Program.* PMD continues to assist the Atlantic Region and the Nova Scotia Department of the Environment in the compliance testing of the electric arc furnace baghouse. Testing will begin in mid 1990.

Air Pollution Control Technology Development and Assessment 3300-67208

Project Manager: P.K. Leung (991-9456)

Objective

Co-operate with C&P responsibility Centres and outside organizations in the assessment of air pollution control technologies through comprehensive emission and process monitoring, and interpretation of results.

Relevance

C&P is required to identify and assess various control technologies that may be used to prevent or reduce the release of pollutants to the environment. Technical advice on control options is required for the development of regulations and codes of good practice.

Work Plan

1. Provide technical advice/guidance to the planning and field implementation of a multi-party program to evaluate a PCB destruction technology (Vesta mobile incinerator).

*2. Characterize emissions and evaluate the low-NO_x burner technology at selected federal boiler plants (joint federal FIBEC program).

3. Complete post-survey work on the emission characterization and performance evaluation of the RDF incinerator in Connecticut, USA (joint EC-EPA NITEP III Program).

4. Input into the consultant's report on the Prince George PCP Waste Study (joint EC-BC program).

*5. Characterize emissions and evaluate the performance of a waste incinerator.

6. Other projects initiated during the review period.

**Scope of these projects determined by availability of external funds.*

Status Report - March 31, 1990

1. *Multi-Party Mobile PCB Incinerator Demonstration Project* (Vesta at Swan Hills).

   a) *Overall Project Planning.* PMD continued to provide technical advice to the other members of the Technical Committee during the planning and design stage of the project. Meetings were held with representatives from EC, Ontario MOE, Quebec MOE, Hydro Quebec, Ontario Hydro, Chem-Securities, Western Research, Concord Scientific and Vesta.

   b) *QA/QC and On-site Witnessing.* On behalf of the regulatory agencies and the hydro companies, PMD assumed responsibilities of Scientific Authority of the External QA contract. Much time was spent in negotiating with the various participants to establish and agree on testing requirements and protocols. An accord was finally struck and a testing plan was published and distributed. A PMD staff member was on-site during Phase I of the emission testing program. However, testing was suspended after an accidental spill at the incinerator site. Project activities will resume early in FY 90/91.

2. *FIBEC Program.* PMD contributed the following to IPB's Federal Industrial Boiler Emission Control Program:

   a) *Promulgation of CEPA Regulations.* The proposed regulation was reviewed and comments were forwarded to IPB. PMD evaluated the performance of a portable gas analyzer and, based on the field experience, proceeded to develop a new Reference Method to be incorporated into the proposed CEPA regulation. PMD also participated in the FIBEC Task Force and provided technical advice to IPB and other members of the FIBEC Task Force on matters related to source emission measurement.

   b) *AES Study.* PMD participated in a joint field testing survey with the private sector to evaluate the performance of a flue gas recirculation unit designed to reduce NO_x emissions. Continuous monitoring of NO_x, SO_2, CO, CO_2, O_2, THCs, moisture, temperature and velocity in the flues were conducted on the base-line and the retrofit boilers under 36 test conditions with various fuels. Test results were forwarded to IPB and ORTECH.

   c) *NCR Federal Boilers Survey.* Twenty-four PWC-operated boilers in the Ottawa area were tested for NO_x, SO_2, and CO emissions. The data-base generated was used by IPB to assess the emission levels of existing federal boilers under various process operating conditions. Test results were forwarded to IPB and ORTECH.

d) *CFB Halifax.* PMD visited the site and assisted the consultant to implement the testing survey.

3. *Joint EC/EPA NITEP III Program.* Post-survey work was completed. PMD has fulfilled all the responsibilities and commitments associated with the testing and evaluation of the RDF incinerator at Hartford, Connecticut.

4. *Joint EC/BC PCP Wastes Incineration Study.* The summary report for the PCP incineration study at Prince George, B.C., was reviewed and comments were forwarded to the Yukon/Pacific Region and the B.C. Ministry of the Environment.

5. *Waste Incinerator.* No external requests were received for the testing and evaluation of a waste incinerator.

6. a) *Unsolicited Proposal.* PMD reviewed an UP entitled "*An On-line MS Research Program*" submitted by ECOLOGIC. Comments were forwarded to IPB.

b) *NO_x Control.* PMD attended an IPB-sponsored commercial presentation on NO_x control technology.

Development of Hazardous Waste Incineration Technologies 3300-67209

Project Manager: P.K. Leung (991-9456)

Objective

1. In support of specific C&P responsibility centre programs, use the System for Thermal Destruction Studies (STDS) apparatus at RRETC to generate decomposition profiles of waste materials from various sources.

2. Modify/upgrade both the STDS apparatus and laboratory to facilitate the study on dioxin formation in the heat recovery systems of municipal solid-waste incinerators.

3. Establish correlations between the bench-scale apparatus and commercial-scale incineration processes.

4. Participate actively in technology transfer exercises.

Relevance

Data on thermal decomposition profiles, products of incomplete combustion and residuals are needed to support incineration as a viable control option. Laboratory studies are the first step in the generation of these supporting data.

Work Plan

1. Develop an operating manual for the STDS.

2. Complete the report on the correlation study using PCP-contaminated wood waste from the Prince George Pulp & Paper survey.

*3. Conduct further research on dioxin formation in the heat recovery system of municipal solid-waste incinerators.

4. Use the STDS to study destruction profiles of waste feeds from various industrial sources, as required.

5. Participate in the joint EPA-EC Hazardous Waste Incineration Research Workshop.

6. Other projects initiated during the review period.

* *Scope of these projects determined by availability of external funding.*

Status Report - March 31, 1990

1. The STDS Operating Manual was completed. Based on PMD's hands-on experience, recommendations on operational procedures and system improvements were forwarded to the STDS equipment supplier.

2. The report correlating the STDS data to the Prince George PCB Study is near completion.

3. No funding was received for the research project to study the formation of dioxin in the heat recovery system of MSW incinerators.

4. No external requests were received for the characterization of destruction profiles for various industrial waste feed material.

5. Technical information exchange with various members of the Hazardous Waste Incineration Research Group is on-going.

6. a) The search for a qualified candidate to fill a proposed term position for the STDS Program continues.

b) PMD reviewed and commented on Alberta Environment's two project proposals to CCEM, namely, "*Thermal Destruction of CFCS*" and "*On-line Analysis of Specific Trace Organic Compounds in Incinerator Flue Gas*".

Scientific and Technical Advice 3200-67210

Project Manager: D. A. Williams (991-9462)

Objective

To provide advice on the measurement and assessment of air pollution in ambient air and as emitted from stationary sources. To advise on the performance and development of air pollution control technologies.

Relevance

Dissemination of knowledge necessary for the identification, characterization and assessment of air pollution problems in Canada.

Work Plan

As required.

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1. T. Dann was appointed member of the toluene/xylenes and trichloroethylene/tetrachloroethylene CEPA PSL work groups. Input to these and a number of other PSL assessment activities was provided.

2. An extensive training program for Ms. J. Wang, on assignment from Cbina, was developed and implemented by PMD staff.

3. Over 100 specific requests for copies of air toxics monitoring reports, for information on air toxics sampling and analysis procedures and for advice on interpreting air quality information were received and handled during the year. Advice was also provided to a large number of individuals and associations on ozone and its precursors as a result of the NO_x/VOC consultation process. Over 20 media inquiries related to air toxics and ozone were responded to.

4. Reviewed the report entitled "*British Columbia Ministry of Environment, Contribution to National Monitoring Programs*" Data

Quality Review. Specific recommendations regarding monitoring, data validity and calibration audits of NAPS provincial stations in British Columbia were made.

5. Information and technical advice related to ambient air measurement and air quality data interpretation was provided to various provincial and municipal organizations, various reporters from the news media and visitors during the GLOBE90 international exhibition in Vancouver and during Environment Week in Ottawa/Hull. Translation services of technical, non-technical documents and correspondence were provided to members of the Division.

6. Summary of Technical Advice and support from the Source Measurement Section were as follows:

REGIONS, PROVINCES and FEDERAL DEPARTMENTS

- *Raynald Brûlotte*, MENVIQ, Quebec re: VOST method and isokinetic calculation.
- *Gene Riley*, US EPA, Durham re: In-house CAD drawings of MM5 organic sampling module and SVOC and HCl.
- *Gary Wong*, MOE, Toronto re: Sampling for acetylene and CR^{+3} and CR^{+6} and Environment Canada RMs..
- *Doug Whittaker*, GVRD, Vancouver, re: Part/Metals/Hg/HCl sampling at the Burnaby Incinerator.
- *Trevor Ruthman*, IPB, Hull, re: Specifications for glass fibre filters.
- *Dave Lockhart*, BC MOE, Victoria, re: Particulate sampling from hog fuel boiler.
- *Dale Cameron*, Ottawa District Office, Ottawa, re: Sampling requirements for a proposed bio-medical waste incinerator.
- *Shawna Mercer*, Western & Northern Region, Edmonton, re: SVOC and HCl sampling.
- *Claude Gonthier*, Quebec Region, Montreal, re: Sampling organic compounds from tarring plants.
- *Carl Morden*, Ontario Region, Toronto, re: Auditing check lists for PVC compliance testing.
- *Esther Bobet*, Ontario Region, Toronto, re: Particulate sampling method and recommended equipment.
- *John Holmes*, Pacific Region, Vancouver, re: Auditing equipment for CEPA tests.

- *Clark Wiseman*, Atlantic Region, Halifax re: Mercury sampling and QA/QC procedures.
- *Dr. Win Lee*, EM&R, Ottawa, re: Review stack sampling calculations.
- *Vladimir Razbin*, EM&R, Ottawa re: Calibration of bottled gases.
- *Michel Fournier*, Consumer & Corporate Affairs, re: Calibration techniques for air moving devices.
- *Dick Drolet*, Consumer & Corporate Affairs, re: Spirometer manufacture.
- *Bernard Garboury*, MENVIQ, Quebec, re: Reference methods.
- *Earl Craig*, Saskatchewan Env. & Public Safety, Regina, re: Cl_2 emissions.
- *Larry Blanchette*, RCMP, Ottawa, re: Reference methods and test costs.
- *Rein Otson*, Health and Welfare, Ottawa, re: VOST.
- *Simon Buckland*, Science & Industry Research Dept., New Zealand, re: SVOC and NITEP.
- *Indrani Rajaram*, Republic of Singapore, Singapore, re: SVOC.
- *Phil Bladgen*, Dept. of Labour, Nfld. and Labrador, St. John's, re: Stack and ambient testing.

UNIVERSITIES

- *Brian Stanmore*, University of Queensland, Australia, re: CAD drawings of a water-cooled probe.
- *Veronique Roy*, University of Laval, Ste-Foy, re: PAH testing and in-house design of organic sampling module.
- *Stefan Czernik*, University of Sherbrooke, Sherbrooke, re: Organic sampling from a high temperature pyrolysis unit.

CONSULTANTS

- *Neil McCall*, Pacific Resting Ltd., Victoria, re: Glassware fabrication and DGM repairs.
- *Sam Popkoff*, Konheim and Ketcham, New York, re: Copy of Royal Jubilee Report.
- *Joseph Oxley*, Battelle-Columbus Labs, Columbus, re: Copy of Chatham CFB organic testing report.

- *Ann Crevier*, Sociétié D'Ingenierie Cartier, Montreal, re: Modification of M5 for multi-metals determination
- *Hélène Deschamps*, SODEXEM, Montreal, re: Design of a Part/HCl/Metals/Hg sampling train
- *Gilles Tremblay*, SODEXEM, Montreal, re: VOST sampling.
- *Steve Thorndyke*, Ortech International, Mississauga, re: copy of NITEP Quebec City summary report.
- *Mark Golland*, Alliance Corp., Bedford, re: Techincal drawings for Hartford RDF incinerator.
- *Brent Sadler*, Flakt Canada, Ottawa, re: Repair and calibration of stack sampling equipment.
- *Donna Dougherty*, Concord Scientific Corp., Downsview, re: QA procedures for the VESTA PCB program.
- *Louis Lawson*, Envirobec, Ste-Foy, re: VOST.
- *Katherine Wong*, Environmental Applications Group, Toronto, re: Phenol and formaldehyde sampling.
- *Kiroshi Kubotani*, Xenon, Vancouver, re: Organic sampling.
- *Sylvain Chenail*, LNR Consulting, Sherbrooke, re: NO_x testing.
- *Library*, Research Cottrell, Somerville, N.J., re: SVOC.
- *Paul Beauchemin*, Chem Security, Vancouver, re: Cyclonic flow.

OTHER

- *Dr. Dan Poggi*, Noranda Research Centre, Montreal, re: MM5 sampling for PAHs, CPs and CBs.
- *Ernest Malby*, Noranda Research Centre, Montreal, re: Development of sampling method for thallium.
- *Frank Britten*, N.B. Power, Fredericton, re: Comparison of results from simultaneous particulate sampling.
- *Frank Kimmerle*, Alcan International Limitée, Jonquière, re: SO_2, NO_x and VOC sampling methods from Al industry.
- *Valier Simard*, Consolidated Bathurst, Portage-du-Fort, re: Port location and sapling points for horizontal flue.
- *Dennis Sterling*, Esso Petroleum Canada, Sarnia, re: MM5 sampling techniques.

- *Alfred Lam*, Env. Applications Group, Toronto, re: Source testing wet sources.
- *Perry Chomicki*, Mines Noranda Ltée, Rouyn, Noranda, re: QA/QC software and data reduction practices.
- *Bob McDonald*, Mines Noranda Ltée, Rouyn, Noranda, re: Selection criteria for sampling equipment.
- *Norbert Sass*, Mines Noranda Ltée, Rouyn, Noranda, re: Sampling for SVOCs, HCl and HF.
- *J.F. Clement*, Mines Noranda Ltée, Rouyn, Noranda, re: Validate SO_2/SO_3 sampling method from high level sources.
- *Bob McDonald*, Mines Noranda Ltée, Rouyn, Noranda, re: Part/SO_2 sampling from intermittent sources.
- *Chris Gilmore*, N.B. Power, Fredericton, re: Stack testing.
- *Kelly Takatche*, Manitoba Research Council, Winnipeg, re: Roof vent emissions testing.
- *Gianfranco Pazzuello*, Hydro Quebec, Montreal, re: Reference methods.

Vehicle Emissions Testing Laboratory

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Quality Control / Assurance 3200-67810

Project Manager: J. Rostkowski (998-9590)

Objective

To ensure that the Vehicle Emissions Testing Laboratory (VETL) maintains an internationally recognized reputation for accuracy and precision of mobile source emissions test data, and has the capability to complete all project work including research and development (R&D), necessitates the undertaking of a wide range of quality control/assurance activities.

These activities include: calibrations, troubleshooting, preventative maintenance, refurbishing and upgrading of the test instrumentation, quality control vehicle testing, reference standard verification for regulated emission analyzers, non-regulated emission analyzers (e.g. gas chromatography (GC), high precision liquid chromatography (HPLC)), and sampling trains and international vehicle test and chemical reference standard cross-correlation programs.

The VETL is recognized as a correlation site for exhaust emission testing and chemical and reference standard analysis for mobile source emissions analysis (analysis support from PMD and CD).

Relevance

Environment Canada would have no credibility and thus no influence in mobile source emission matters without accurate test data from the project work undertaken. Decisions based on unverified test results would be questionable.

Work Plans

1. In-house calibrations, repair and modifications totalling 90 working days per year on the four test cells.

2. Approximately five vehicle test cross-correlation projects per year of one week each including: Motor Vehicle Manufacturers Association (MVMA), Japanese Automobile Manufacturers Association (JAMA), Environmental Protection Agency (EPA) (3), and the major automotive manufacturers (2). Summary reports are prepared for each program.

3. Two chemical analysis/reference standard cross-correlation programs are conducted per year for non-regulated emissions (e.g.

alcohol, aldehyde/ketones) with US EPA and other R&D testing facilities (e.g. manufacturers).

4. Conduct a minimum of 250 emission tests.

5. Establish reference standards for alcohol, volatile organic compounds and aldehyde/ketone analysis including preparing standards, monitoring daily operations of instrumentation through standards and verifying accuracy of test data.

6. Analyze 300 gaseous bottle concentrations for concentration levels and impurities.

7. Analyze 20-40 fuel samples to determine the state of the test fuel for each project. Preparing fuel samples for complete analysis at research laboratories including interpreting the results.

8. Design quality control procedures and instrumentation for previously non-sampled compounds.

9. Design quality control procedures for monitoring and assessment programs of heavy duty vehicles including characterization of the exhaust.

Status Report - March 31, 1990

1. Total in-house quality assurance and cross-correlation testing activity is shown below:

EMISSION TESTS

UDDS (city cycle)	60
HWFCT (highway cycle)	45
864 - HOT	250
EVAP (evaporative emissions)	15

2. a) General Motors co-ordinated and conducted the testing for a 1989 Motor Vehicle Manufacturer's Association (North American vehicle) cross-correlation test program. The certification group from the GM Proving Grounds conducted the testing at the VETL in August.

b) The laboratory participated in the 1990 MVMA cross-correlation program (1st quarter), co-ordinated by the Chrysler Corporation. The correlation vehicle was tested at the facility during the last week of February 1990.

A report was prepared on the results of the testing.

c) The VETL initiated a diesel particulate cross-correlation test program with General Motors in July 1990. A 6.2 l diesel truck (1/2 ton) was transported to the GM testing facility to evaluate both regulated exhaust emissions and particulate matter.

d) Suzuki Canada (CAMI) requested the services of the VETL to test a repeat car in order to correlate the new testing facility at the Suzuki assembly plant in Ingersol, Ontario.

e) Mazda Corp. of the Japanese Automotive Manufacturer's Association co-ordinated the 1989 JAMA vehicle and gas cylinder cross-correlation program. The VETL is the only Canadian laboratory to participate in this program along with the Japanese, US and California and European Japanese manufacturer's facilities.

A report was prepared on the results of this testing.

3. An exchange of reference standards was undertaken between EPA, Ortech International and the PMD/VETL organic laboratory evaluating aldehyde/ketones. This exchange was initiated by Ortech to verify the accuracy of their organic analysis as they are involved with contract work with Transport Canada's methanol vehicle test program.

4. 370 Emission tests were completed for QA/QC purposes.

5. a) A technique was set up, including a bottle reference standard for the measurement of individual hydrocarbons, using gas chromatography. The VETL will concentrate on the measurement of methane from gasoline and natural gas fuelled vehicles.

   b) The quality assurance/control procedures and reference standard requirements were established for hydrogen analysis using gas chromatography with a thermal-conductivity detector.

   This procedure was implemented for the evaluation of electric-powered vehicles. The process was established and was transferred to the research group at the University of Ottawa.

   c) A joint project was initiated with the Chemistry Division - RRETC to establish the level of confidence in the dilution tunnel techniques for evaluating PAH and n-PAH. As phase one of the project, a series of tunnel blanks and filter analyses were conducted to determine tunnel hang-ups.

   For phase two, a syringe injection pump was ordered to conduct controlled sampling through the tunnel. This testing will be conducted in FY 90/91.

6. The calibration lab analyzed 325 gas bottles for concentration and impurities.

7. a) The VETL conducts quick checks on the test fuels using Reid Vapour Pressure to determine the quality of the fuel over long-term projects and when fuels are blended by the facility (i.e. alcohol fuels).

   b) For the 89/90 FY, the VETL had established a contract with the Alberta Research Council to analyze fuel samples for the Canadian Motor Vehicle Safety Act (CMVSA) standardized parameters. Over this period, eight analyses were requested.

8. To monitor and assess the H_2S emissions from state-of-the-art technology vehicles, a Flame photometric detector was ordered. A set-up was implemented to operate this detector in parallel with the thermal-conductivity detector on the same gas chromatograph. This detector provides the additional capability of SO_2 analysis. The completion of the instrumentation is scheduled for May 1990.

9. The heavy duty vehicle dynamometer test cell was commissioned in March 1990. During the month of March, the quality control staff established the operating characteristics of the dynamometer, established the quality control parameters and conducted a series of tests on an urban transit bus on loan from National Research Council (NRC). This particular bus was used as a reference standard as it had been tested at Southwest Research.

New Motor Vehicle Compliance 3200 - 67820

Project Manager: P. Barton (998-9590)

Objective

Light duty gasoline and diesel passenger cars and trucks are tested to determine whether they comply with the applicable Canadian exhaust, evaporative emission, and particulate emission standards and fuel economy guidelines. Vehicle models are selected for the program based upon the sales volume, introduction of new models, engine and/or emission control systems.

Vehicles undergoing compliance testing require mileage accumulation to 3500 km. A selection of these vehicles are test driven by VETL on a prescribed urban/highway route complying with the test procedures. The remainder of the vehicles are transported to the Transport Canada facility in Blainville for mileage accumulation.

Vehicles, which do not comply with the exhaust, evaporative and/or particulate (diesel) emission standards, or do not meet the Transport Canada specified fuel consumption guidelines, may receive an additional 2500 km mile accumulation and are retested. If non-compliance persists, these vehicles are investigated and corrective action is taken. The VETL provides the test facilities, technical and engineering personnel and advice during the investigations with the manufacturers.

Relevance

It is essential that new motor vehicles comply with the emission standards under the Motor Vehicle Safety Act to prevent an increase in the air pollution burden in Canada.

Work Plan

1. (a) Conduct 350 urban and highway exhaust emission tests on sixty new vehicles.

   (b) Conduct a minimum of 120 evaporative emission Sealed Housing for Evaporative Emissions Determination (SHED) tests.

   (c) Accumulate 3,500 km on 10 to 12 vehicles for a total of 42,000 km.

   (d) Prepare reports for Transport Canada on each vehicle and on each failure investigation.

2. Investigate 10 to 15 failed vehicles including conducting 100 exhaust emission tests and provide technical/engineering services and facilities as required. Investigations average 3 days each.

Status Report - March 31, 1990

1. (a) Vehicle Status

	1988 Model Year	1989 Model Year	1990 Model Year
Received	--	64	45
Released	--	54	23
Testing	--	--	19
Investigation	1	10	4

(b) Emission Tests

Urban	336
Highway	80
Evaporative	90

(c) Total Mileage Driven - Approximately 42,000 km

(d) Compliance Reports Completed Total = 75

2. Compliance Investigations

a) *GM.* Testing of a Corsica resulted in a non-compliance in exhaust emissions for carbon monoxide. The vehicle was transported to the General Motor's facility in Detroit for a manufacturer's evaluation. The result of the testing was a revised procedure and an extended test program to evaluate canister loading.

b) *GM.* Testing of a GMC C-15 P/U resulted in a compliance failure. The manufacturer has evaluated the test data and has recommended additional test procedures. The vehicle is still under investigation, pending Transport Canada's review of the latest information.

(c) *GM.* A 1988 GMC diesel P/U was non-compliant for particulate mass. The vehicle was tested at the manufacturer's test facility with similar results to the VETL. GM investigated the operation of the vehicle, undertook corrective measures and retested the vehicle for emissions. The results marginally complied with the standards. Transport Canada released the vehicle.

(d) *GM.* Testing and a manufacturer's investigation of a Chevrolet Sprint indicated that the catalyst was not functioning as designed. Replacement of this unit resulted in compliance.

(e) *VW.* A Golf diesel was determined to be non-compliant for particulate mass after VETL testing. The regulatory group at Transport Canada is pursuing the manufacturer for an investigation.

(f) *Lada.* A 1990 Samara was non-compliant with exhaust emissions. The manufacturers conducted an investigation of the vehicle but have not as yet determined the cause of the high emissions. The investigation is on-going.

(g) *YUGO.* Testing of a 1988 YUGO resulted in non-compliance for all regulated exhaust emissions. It was not possible to conduct a manufacturer's investigation as a result of the

difficulties in contacting the Canadian distributor. Further investigation by VETL staff has determined that a secondary air control valve is faulty. Transport Canada has requested further testing after replacement of the valve.

(h) *Chrysler.* Dodge P/U truck secondary air solenoid was found to be defective. The investigation is on-going.

(i) A series of five vehicles are being held pending a manufacturer's evaluation for high fuel consumption values (Ford, Chrysler, GM, Isuzu, Suzuki).

New Fuels and Technologies 3200-67830

Project Manager: G. Rideout (998-9590)

Objective

Conduct vehicle testing and research and development on a wide range of alternate fuels and new power plant/vehicle technologies (e.g. hydrogen, engines and electric vehicles). The alternative fuels include alcohol, alcohol blends, compressed natural gas, propane, gasoline blends, diesel and diesel blends, and electrics.

Design, development and construction of sampling equipment and instruments for testing unregulated pollutants such as unburned alcohol, aldehyde/ketones, VOC's, PAH's, nitro-PAH's, trace metals, dioxins, PCB and furans.

Development of sampling techniques, quality control procedures and analysis procedures where none exists.

Relevance

It is essential that alternate fuels and alternate power plants be thoroughly evaluated under Canadian operating conditions to ensure that there will be no adverse environmental consequences resulting from their use.

Methods and instrumentation must be developed to undertake a complete characterization of the exhaust and to measure precisely the unregulated pollutants of known health hazards identified in the characterization. The test data from these programs can ultimately affect regulatory decisions relating to fuels and pollutant emission level limits.

Work Plans

1. A joint government/industry project to optimize the operation of a propane-powered vehicle including evaluating cold weather emissions.

2. A joint government/industry development project for a propane fuel injection system for light duty vehicles.

3. A test project to evaluate a tar sands fuel blended for the 1990's.

4. A joint government/industry diesel fuel matrix test program on heavy duty vehicles.

5. Testing for an IPB low blend alcohol/fuel additive cold weather test project.

6. Conduct a low blend alcohol pilot project on light/light-heavy duty trucks.

7. Conduct an evaluation of natural-gas-fuelled urban transit buses.

8. Conduct joint Transport Canada/VETL methanol-fuelled vehicle testing on light duty vehicles.

Status Report - March 31, 1990

1. a) The VETL co-ordinated a joint government/industry Propane Gas Association (PGA) program to optimize a state-of-the-art propane conversion system for emissions and performance. As a result of the testing, the representatives from IMPCO were successful in modifying the system to both reduce exhaust emissions and fuel consumption. A report was prepared on the program.

   b) PGA requested the services of the VETL to conduct an assessment of exhaust emissions from two light duty trucks under cold weather conditions. A report has been prepared on the testing.

   c) The VETL/PGA initiated a project to conduct a characterization of the exhaust from a single propane powered vehicle at standard conditions. The emissions to be evaluated included aldehyde/ketones, volatile organic compounds, particulate mass, methane, and sulfur compounds.

2. Project cancelled.

3. Project delayed until FY 90/91.

4. This project was to be scheduled as Phase 2 of the diesel fuel matrix testing. Phase 1 was conducted using engine testing at Ortech International. EMR, the resource group for the project, decided not to pursue the vehicle testing phase.

5. The VETL conducted a joint VETL/Transportation Systems Division, IPB project, to evaluate the exhaust emissions from three light duty vehicles operating on low blend alcohol/additives under cold weather conditions.

   The project was designed to evaluate a 10% ethanol fuel and MTBE as an additive (11% by volume). The VETL sampled and analyzed regulated emissions, alcohol, aldehyde/ketone and volatile organic compounds.

   TSD is preparing a report on the testing program.

6. Project delayed due to lack of resources.

7. Project rescheduled for FY 90/91.

8. a) As a joint project with Transport Canada, the VETL conducted a characterization of the exhaust emissions from a flexible fuel vehicle (methanol/gasoline). The Ford Crown Victoria was tested on blends of 25%, 50% and 85% methanol/gasoline and on 100% gasoline. A report has been prepared on the testing.

   b) The VETL initiated a testing project to characterize the exhaust emissions on manufacturer's prototype vehicles designed to operate on neat methanol. The first phase of the project was initiated to evaluate the original manufacturers' vehicles (e.g. 1985 Toyota Camry and 1986 Golf GTI). Phase 2, scheduled for FY 90/91, will evaluate state-of-the-art technology vehicles available from the manufacturers.

NEW

9. A joint testing project was established with Consumers Gas (Mississauga) to evaluate the company's passenger car vehicles, converted to operate on natural gas (dual fuel). The initial part of the project consisted of testing a 1990 Lumina converted, using an Impco/Tartarini system. A report has been prepared on the testing. Phase 2, proposed for FY 90/91, consists of an optimization program for the dual-fuel system, a characterization of the exhaust and cold weather testing. EMR has been requested to be a participant in this joint government/industry venture. Phase 3 of the project will consist of an assessment and optimization of a natural gas gaseous fuel injection system.

10. Magna International (VEHMA) requested the testing services of the VETL to monitor and assess the levels of hydrogen from the batteries, powering an electric van (G-van) during the charging sequence. A report is being prepared on the testing.

Motor Vehicle Surveillance 3200-67840

Project Manager: P. Barton (998-9590)

Objective

To conduct testing to evaluate the performance, exhaust emissions, evaporative emissions, and fuel consumption of new and in-use motor vehicles under ambient conditions (cold weather), modified vehicle and emission control performance and operating on various commercial fuels. With in-use vehicles, emphasis will be on assessing tampering rates and benefits associated with inspection and maintenance.

Relevance

This work assists in addressing the environmental concerns of Environment Canada and in setting future emission standards to prevent further increases in the total motor vehicle pollution burden.

Work Plans

1. Conduct a cold weather test project on five state-of-the-art technology vehicles to evaluate cold weather exhaust emissions and the effects of block heaters.
2. Conduct a pilot project on vehicle exhaust emission characterized by modal analysis.
3. Monitor the air fuel ratio of light duty vehicles during urban/city and highway representative chassis dynamometer cycles.
4. Conduct an in-use test project to evaluate emissions from high mileage vehicles.
5. Evaluate the effects of fuel variations on exhaust evaporative emissions.

Status Report - March 31, 1990

1. A joint VETL/IPB test project was developed to evaluate the exhaust emissions from state-of-the-art technology vehicles under cold weather test conditions. The project included monitoring the air-fuel ratio and conducting a series of tests on the effects of block heaters.

A report is being prepared by TSD/IPB.

2. Project delayed until FY 90/91.

3. Project included in cold weather testing.

4. The project to evaluate exhaust emissions from high mileage vehicles was proposed by TSD/IPB. This group decided not to undertake the project during FY 89/90.

5. Joint VETL/TSD - IPB test projects were developed to investigate the effects on evaporative emissions as a result of extended heat builds and on extended hot soaks. Both test projects were undertaken as pilot projects on 2 - 3 vehicles prior to TSD / IPB developing the optimum cycle for evaluating a large population of vehicles.

   Test reports have been prepared by VETL for TSD on the pilot projects. Phase 2 testing is proposed for FY 90/91.

Technical Advice and Assistance 3200-67850

Project Manager: F. Hendren (998-9590)

Objective

On a continuing basis, to provide engineering advice and assistance to the public, government agencies, other governments and private industry including technical advice, assessment of inventions and commercially available devices/additives, mobile source testing, training, equipment evaluation, loan of equipment, and direct technical assistance in the motor vehicle technology and testing field.

To provide testing, evaluation and technical advice on a contract basis to manufacturers of new vehicles (off-shore) and private industry involved in the field of mobile source technologies.

Relevance

This service plays an important role in furthering the aims of the Department and is not available elsewhere in Canada.

Work Plans

1. Provide technical assistance to Canadian exhaust emission test facilities in the form of developing quality control procedures/ programs, evaluating test results, conducting cross-correlation test projects and providing analysis of fuels and reference gas cylinders.

2. Provide analysis service to private industry as a master analysis laboratory, etc.

3. Provide engineering evaluation of fuel economy/emission reducing devices including vehicle testing of above devices on a cost-recovery basis.

4. Attend court as expert witness for test projects conducted at the VETL (i.e. technical expertise for evaluation of devices on behalf of Consumer and Corporate Affairs).

5. Provide vehicle emission and performance evaluation testing on a cost-recovery basis.

6. Respond to requests for technical information.

Status Report - March 31, 1990

1. a) *Blainville Transport Canada Test Laboratory.* The VETL provided technical expertise and engineering analysis of a correlation vehicle in support of the laboratory's exhaust emissions quality assurance program.

   b) *University of Ottawa.* The VETL provided technical expertise to the Electrochemical Science and Technology Centre on the techniques and instrumentation for hydrogen analysis.

   c) *Suzuki of Canada.* Suzuki commissioned an exhaust emissions test cell at the manufacturing plant in Ingersoll. The VETL provided technical support in establishing the quality assurance program by serving as a reference point for bottle analysis and by conducting critical flow orifice injections.

   d) *MOT-Ontario.* Requested the support of VETL in implementing an automated driver's video display and the loan of test equipment.

2. a) *Matheson.* As a service to industry, the VETL serves as a cross-reference point for Matheson Gas Products. Gas cylinders are sent to the VETL for analysis.

3. The VETL has provided technical expertise and engineering analysis in evaluating the following retrofit devices which are purported to reduce fuel consumption and/or exhaust emissions:

- Renergy - fuel additive
- Microlon - oil additive
- Powerstick* - fuel additive
- Solpower* - fuel additive
- Unicurve - vacuum valve
- Condensator - PCV filter
- FIPS* - water injection system
- Vitalizer* - fuel conditioner (electrostatic)
- Pesco - magnetic fuel conditioner
- Aderco* - fuel additive

** Tested at the facility on a cost-recovery basis.*

4. The VETL was subpoenaed to serve as an expert witness for Consumer and Corporate Affairs as a result of testing conducted on the additive Carburetion Plus. A second appearance was required for the same additive for the province of Quebec.

5. a) *DND.* The VETL conducted a test project on a modified carburation system for the Iltis.

   b) *Transport Canada.* The facility conducted a diurnal loading - repeatability project on a compliance vehicle to determine the effects of canister loading.

6. *Davis Engineering.* The VETL provided a technical report to Davis Engineering (consultant for government of South Korea) on the design for an exhaust emissions test facility.

7. *Concordia University.* Engineering students at Concordia were participating in the GM Methanol Marathon race. The university requested the VETL's services to evaluate the emissions from the race vehicle, as low emissions contributed to the final standing in the race.

Support to Regulation & Guideline Development 3200-67860

Project Manager: G. Rideout (998-9590)

Objective

Test projects are conducted to support Environment Canada's evaluation and development of emission regulations and guidelines for light and heavy duty vehicles.

Relevance

It is essential that testing be undertaken to assist in the development of regulations and guidelines to minimize air pollution from motor vehicles in Canada.

Work Plans

1. Conduct a light duty gasoline/diesel vehicle test project to evaluate VOC and semi-VOC in urban, city and highway conditions. A total of 150 exhaust emission tests will be conducted during 90/91. Approximately 50 tests will be completed by the end of FY 89/90.

2. Conduct 30-50 exhaust emission tests on a series of light/heavy duty trucks to evaluate regulated and non-regulated exhaust emissions and particulate mass. Non-regulated emissions to be evaluated include VOC, semi-VOC, trace metals, dioxins, furans, sulfur compounds, PCB's.

3. Conduct a screening program on industrial equipment, (e.g. backhoe, generators, etc.) to evaluate SO_x and NO_x levels. Both regulated and non-regulated emissions will be evaluated.

4. Conduct exhaust and evaporative emission tests on a series of light duty vehicles using a matrix of aromatic content in commercial gasolines.

5. Evaluate on-board refuelling emissions.

6. Conduct HC speciation of exhaust emissions from light duty vehicles to evaluate levels of toxic compounds.

7. Conduct a test project to investigate the correlation between road and dynamometer exhaust emissions using the raw exhaust continuous sampling system.

Status Report - March 31, 1990

1. The VETL initiated a testing program to investigate the pollutants being emitted from light duty passenger cars by characterizing the exhaust. The testing program is evaluating approximately 20 vehicles from the 1990 compliance audit fleet. The emissions being evaluated include: aldehyde/ketones, volatile organics, sulfur compounds, methane, trace metals and PAH, n-PAH.

   As of March 31, 1990, five vehicles have been characterized.

2. The heavy duty test cell was commissioned three months later than scheduled, therefore, the project to characterize the exhaust from light/heavy duty vehicles was postponed.

3. Initial development was conducted on a technique for evaluating exhaust emissions from on-road/off-road vehicles equipment. As a

result of insufficient funding, the project was put on hold pending resources in FY 90/91.

4. No testing was conducted on this project.

5. Project has been put on hold pending a decision by the US EPA as per the testing procedures to be implemented for conducting on-board refuelling emissions.

6. Project to undertake speciation of HC component of exhaust was incorporated in IPB projects of cold weather testing and evaluation of low blend alcohols/additives in cold weather.

7. Project delayed due to funding availability.

NEW

8. A joint VETL/TSD - IPB project was developed to evaluate the exhaust emissions from diesel-powered urban transit buses. The project was initiated in March 1990 with one bus being tested. The project is to be continued in April/May of FY 90/91.

   The objective of this project is to provide a baseline for the evaluation of alternatively fuelled urban transit buses.

Facility Upgrading 3200-67870

Project Manager: P. Barton (998-9590)

Objective

To have the capability of conducting development work and assessment projects in the areas of heavy duty vehicles (urban transit buses and trucks), CEPA related mobile source non-regulated emissions, light duty vehicle operation in ambient conditions and regulation / guideline development work, it is necessary to upgrade the facility.

At the completion of the upgrading, the facility will serve as the centre of expertise in Canada (with international standing) for mobile source emissions testing and analysis of non-regulated emissions.

Relevance

This service will play an important role in furthering the aims of the Department not only in the area of assessing the emissions from mobile sources but also in improving the air quality as a result of technology development being transferred to industry.

Work Plans

1. Implement cell #4 for vehicle pre-conditioning and compliance testing.

2. Upgrade cell #2 to have the capability of testing single axle buses (urban) and trucks, having a maximum of 40K lb inertia weight (IW) simulation and 250 Hp.

3. Upgrade cell #2 to have the capability of conducting heavy-duty vehicle testing in ambient conditions.

4. Upgrade fuel storage shed for storage of a range of diesel fuels including fabrication of a diesel fuel pumping system.

5. Complete modifications of the analysis laboratory dedicated to fuel analysis, non-regulated emissions and particulate mass analysis.

6. Upgrade the existing evaporative emission chambers to evaluate on-board fuelling emissions.

7. Upgrade test cell to evaluate light duty vehicle running losses.

Status Report - March 31, 1990

1. Cell no. 4 has been commissioned for conducting vehicle pre-conditioning. Also, the automated duty cycle video display system has been connected with the automated analyzer bench in cell no. 2 to provide cell no. 4 with the capability for complete exhaust emissions analysis for compliance testing.

2. The heavy duty vehicle test cell was commissioned in March 1990. The cell has the capability of testing single axle vehicles at inertia weights of 45,000 lbs. and continuous road load horsepower of 250.

   The cell can accommodate articulated buses 61 feet in length.

3. Cell no. 2 was modified to have the capability of conducting ambient temperature testing (cold weather).

4. Project has been delayed due to budget restraint.

5. The dedicated VETL organic analysis laboratory was completed in March 1990. The facility will provide the VETL with a dedicated location for fuel analysis (Reid Vapor Pressure, distillation, specific gravity), foam extractions, canister clean-up, etc.

The laboratory also includes a small dedicated chamber for particulate mass analysis.

6. Project not initiated pending a decision from IPB/TSD on procedures and instrumentation.

7. Project has been cancelled by TSD.

NEW

8. Dilution tunnel room for particulate analysis and non-regulated emissions assessment was expanded with CEPA funds. This provides the facility the capability of conducting emissions analysis for volatile organics, sulfur compounds and independent hydrocarbons at the location of sampling.

Appendix A
List of Reports and Papers

Manuscript (unedited) Reports

1. Goldthorp, M., *"Review of Person-Portable Instruments for Chemical Response"*, Environment Canada Manuscript Report No. EE-118, Ottawa, Ontario 185p., 1989.

2. Lee, S.C., Mackay, D., Bonville, F., Joner, E., and Shiu, W.Y., *"A Study of the Long-Term Weathering of Submerged and Overwashed Oil"*, Environment Canada Manuscript Report No. EE-119, Ottawa, Ontario, 59p., 1989.

3. Environment Canada, "*Detroit Incinerator Monitoring Program, Data Report #3*". PMD 89-8.

4. Dann, T. "*Polycyclic Aromatic Hydrocarbons in the Ambient Air of Toronto, Ontario and Montreal, Quebec*". PMD 89-14.

5. Dann, T. and Wang, D. "*Measurement of Volatile Organic Compounds in the Greater Vancouver Regional District.*" PMD Report 89-15.

6. Dann, T. "*Speciation and Reactivity of Volatile Organic Compounds in Ambient Air Samples and Emission Inventories*". PMD 89-16.

7. Dann, T., Mar, J. "*Evaluation of a Commercial Continuous Inhalable Particulate Monitor (MDA Scientific BAM 102)*". PMD 89-24.

8. *"Methodology for Organic Analysis - NITEP/Mid-Connecticut Combustion Test"* Ref. #CD891201, December 1989.

Environment Canada (edited) Reports

1. *Spill Technology Newsletter*, Vol.14(2) June 1989, Vol.14(3) September 1989, Vol.14(4) December 1989 and Vol 15(1) Manuscript.

2. "*National Air Pollution Surveillance Monthly Summary*". January 1988 to December 1988. Report EPS 7/AP/1-88

3. "*National Air Pollution Surveillance Annual Report 1987*". Report EPS 7/AP/20.

4. National Air Pollution Surveillance Annual Report 1988". Report EPS 7/AP/21.

5. "*Reference Method for Source Testing: Measurement of Releases of Gaseous Hydrogen Chloride from Stationary Sources*". Report EPS1/RM/1. June 1989.

6. "*Reference Method for Source Testing: Measurement of Releases of Selected Semi-volatile Organic Compounds from Stationary Sources*". Report EPS 1/RM/2. June 1989.

7. "*A Method for the Analysis of PCDDS, and PCDFs and PCBs in Samples from the Incineration of PCB Waste*" Reference Method, Report EPS/RM/3, June 1989.

8. "*Proposed Reference Method for the Determination of PCDDs and PCDFs in Pulp and Paper Mill Effluents*" 1st draft, March 1990.

9. *Response Techniques for the Clean-up of Sinking Hazardous Materials*, EPS4/SP/1, April 1989.

Technical Papers

1. Fingas, M.F., *"Review of Personal Protective Equipment for Spills"*, Spill Technology Newsletter, Vol. 14, No. 4, pp. 6-13, 1989.

2. Fingas, M.F., *"Computer Models and Data Bases for Spills"*, Spill Technology Newsletter, Vol. 14, No. 2, pp. 4-10, 1989.

3. Fingas, M.F., Di Fruscio, M., White, B., and Crerar, I., *"Studies on the Mechanism of Dispersant Action: Weathering and Selection of Alkanes"*, in Proceedings of the Twelfth Arctic and Marine Oil Spill Program Technical Seminar, Environment Canada, Ottawa, Ontario, pp. 61-90, 1989.

4. Bobra, M.A., *"Water Solubility Behaviour of Petroleum Mixtures"*, in Proceedings of the Twelfth Arctic and Marine Oil Spill Program Technical Seminar, Environment Canada, Ottawa, Ontario, pp. 91-104, 1989.

5. Bobra, M.A., *"Photo-oxidation of Petroleum"*, in Proceedings of the Twelfth Arctic and Marine Oil Spill Program Technical Seminar, Environment Canada, Ottawa, Ontario, pp. 129-148, 1989.

6. Bobra, A.M., Goldthorp, M., and Vandenberg, D., *"Development of Rapid Analytical Systems for Spill Response"*, in Proceedings of the Sixth Technical Seminar on Chemical Spills, Environment Canada, Ottawa, Ontario, pp. 67-80, 1989.

7. Fingas, M.F., *"Dispersants: A Review of Effectiveness Measures and Studies"*, in Proceedings of the Seminar on Dispersant Use, National Oceanic and Atmospheric Administration, Arlington, Virginia, 18 p., January, 1990.

8. Fingas, M.F., *"Evaluation of Chemical Beach Cleaners"*, in Proceedings of a Workshop on the Cleanup of Prince William Sound, National Oceanic and Atmospheric Administration, Seattle, Washington, 5 p., November, 1989.

9. Fingas, M.F., *"Use of Computer Models and Data Bases at Spill Scenes"*, in Proceedings of Dangerous Goods Emergency Response 89, Canadian Chemical Producers, Ottawa, Ontario, pp. 12-24, 1989.

10. Fingas, M.F., *"Review of Person Protective Equipment"* in Proceedings of Dangerous Goods Emergency Response 89, Canadian Chemical Producers, Ottawa, Ontario, pp. 75-93, 1989.

11. Fingas, M.F., *"Computer Models for Spills in Canada"*, in Proceedings of the Workshop on Risk Assessment of Accidental Pollution Related to the Maritime Transport of Harmful Substances, Centre de Documentation de Rercherche et D'Experimentations sur les Pollutions Accidentelles des Eaux, Brest, France, pp 24-54, 1989.

12. Fingas, M.F., *"Analytical and Detection Systems for Spill Response"* in Proceedings of the Workshop on Risk Assessment of Accidental Pollution Related to the Maritime Transport of Harmful Substances, Centre de Documentation de Rercherche et D'Experimentations sur les Pollutions Accidentelles des Eaux, Brest, France, pp 191-210, 1989.

13. Meikle, K.M., Fingas, M.F., and Thornton, D.E., *"AMOP - The Arctic and Marine Oilspill Program"*, Proceedings of the 16th CPA Fairmont Workshop, 1990."

14. *"Interlaboratory Comparison Studies on the Measurement of PCDD/PCDF in Pulp and Paper Matrices"*, Chemosphere, Vol. 9, pg 7-12, 1989.

15. *"Dioxins in Ambient Air - Sample Analysis Methods"*, presented at the Ambient Air Workshop for Dioxins/Furans, September 17, 1989, Toronto.

16. *"Development of Ambient Air Monitoring Methodologies for Dioxin and Furans"*, a joint publication of CD, PMD and Ontario MOE, presented at the Dioxin '89 symposium, September 18-22, 1989, Toronto.

17. Bottenheim, J.W., Brice, K.A., Handy, B., Niki, H., Singer, E. and Wang, D. *"Observation of Natural and Anthropogenic Hydrocarbons During the Summer in Central Ontario, Canada, and Their Implications for Elevated Oxidant Episodes."* For presentation at International Conference on the Generation of Oxidant on Regional and Global Scales, Norwich, U.K., 1989.

18. Dann, T., Bumbaco, M., Chiu, C., Dlouhy, J., Li, K., Mar, J. and Wang, D., *"Measurement of Potentially Toxic Airborne Contaminants in Canadian Urban Air"*. For presentation at Eighth World Clean Air Congress and Exhibition (IUPAC), Hague, Netherlands, September 1989.

19. Wang, D., Dann, T., and Mar, J. *"Measurement of Toxic Air Pollutants in Canadian Urban Centres."* For presentation at Ontario AWMA Conference, Hamilton, Ontario. April 1989.

20. Wang, D., Dann, T., Mar, J. and Etlinger, A. *"Sampling and Analysis of Volatile Organic Compounds in Canadian Urban Air"*, for presentation at EMEP Workshop on Measurement of Hydrocarbons/VOC, Lindau, Federal Republic of Germany, September, 1989.

21. Bottenheim, J.W., Brice, B., Handy, B, Niki, H., Singer, and Wang, D., "*Determination of Light molecular Weight Hydrocarbons During the Summer Intensive Eulerian Model Evaluation Field Study in Rural Central Ontario.*" For presentation at EMEP Workshop on Measurement of Hydrocarbons/VOC. Lindau, Federal Republic of Germany, September 1989.

22. Dann, T., Wang, D. and Etlinger, A. "*Volatile Organic Compounds in Canadian Ambient Air: A New Emphasis.*" Proc. of LIS Conference, Sarnia, Ontario. September 1989.

23. Tashiro, C., Clement, R.E., Davies, S., Dann, T., Steer, P., Bumbaco, M., Oliver, B., Munshaw, T., Fenwick, J., Chittim, B. and Foster, M.G. "*Ambient Air Analysis Round Robin*". Nov. 1989 - submitted to Chemosphere.

24. Bobet, E., Berard, M.F. and Dann, T., "*The measurement of PCDD and PCDF in Ambient Air in Southwestern Ontario*". Nov. 1989 - submitted to Chemosphere.

25. Source Measurement Section, "*Terms of Reference: External QA/QC for a Mobile PCB Incinerator Testing and Evaluation Program*", June 16, 1989.

26. Concord Scientific/Source Measurement Section (Scientific Authority), *"External QA/QC Project Plan for a Mobile PCB Testing and Evaluation Program"*, August 1989.

27. Concord Scientific/Source Measurement Section (Scientific Authority), *"Phase One Report - Review of Regulations Pertaining to the Incineration of PCB Wastes"*, August 1989.

28. Source Measurement Section, *"Stack Tests Auditing and Verification Plan for the Goose Bay PCB Destruction Project"*, October 1989.

29. Source Measurement Section, *"Goose Bay Project: Source Sampling Audit Plan"*, November 1989.

30. Source Measurement Section, *"Goose Bay Project: Verification Plan"*, February 1990.

31. Source Measurement Section, *"Procedures for the Construction and Calibration of Critical Orifices and the Auditing of Dry Gas Meters in the Field"*, December 1989.

32. Source Measurement Section, *"Witnessing Forms: SVOCs, Particulates/Metals, VOST and HCl"*, December 1989.

33. Source Measurement Section, *"A Plan for Continuous Emission Monitoring for the FIBEC Program"*, September 1989.

34. Source Measurement Section, *"FIBEC Test Program at AES, Downsview Data Transmittal Report"*, September 1989.

35. Source Measurement Section, *"FIBEC: Summary of Data from PWC Central Heating Plants in the Ottawa Area - Data Transmittal Report"*, March 1990.

36. Source Measurement Section, *"Proposal for a Comparative Study on Asbestos Sampling and Analytical Procedures"*, October 1989.

37. Source Measurement Section, *"Revised Proposal for a Comparative Study of {S-1/A-1} and {MS-3/A-2} Sampling/Analytical Methods"*, March 1990.

38. Source Measurement Section, *"Draft Asbestos Fiber Count Comparison Study"*, September 1989 version.

39. Source Measurement Section, *"Gagetown: Characterization Study on a Boiler Equipped with Retrofitted Low NO_x/SO_x Burners"*, June 1989.

40. Source Measurement Section, *"A Unique Sample Conditioning Procedure for the Continuous Measurement of Hydrogen Chloride in Moisture-Laden Gas Flows"*, June 1989 version.

41. Source Measurement Section, *"Drager Tubes Study: Phase I and Phase II Screening Test Results"*, May/June 1989.

42. Environment Canada/Source Measurement Section, *"Fact Sheet No. 11: Measuring Pollutant Releases to the Atmosphere"*, 1989.

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Appendix B
Employees

Employees ...

director's office

BRUER, Lyle ..... Stores
HEINRICH, Guenter ..... Maintenance Technician
HOWES, Trish ..... Secretary
LACHANCE, Edgar ..... Computer Analyst
LAO, Robert ..... Senior Scientist
SERGY, Gary ..... Manager, WN Region Office
THORNTON, Dave ..... Director
ZONGORA, Veronica ..... Administrative Officer

chemistry

BUMBACO, Mike ..... Chief
CHIU, Chung ..... Head, Organic Lab
DLOUHY, Joe ..... Head, Inorganic Lab
GRAY, Dorothy ..... Secretary
HALMAN, Ron ..... Technician, Organic Lab
HOULE, Nicole ..... Technician, Inorganic Lab
LANOY, Monique ..... Technician, Organic Lab
LI, Ken ..... Chemist, Organic Lab
McDONNELL, Brian ..... Co-Ordinator, Quality Assurance
RITCHIE, Scott ..... Technician, Inorganic Lab
THOMAS, Bob ..... Technician, Organic Lab

environmental emergencies

ADAMS, Carolyn ..... Project Engineer, Engineering
BOBRA, Alice ..... Research Scientist
FINGAS, Merv ..... Head, Chemistry & Physics
GRIBBON, Debi ..... Secretary
KELLER, Lisa ..... Project Engineer, Engineering
MEIKLE, Ken ..... Chief
PUNT, Monique ..... Project Engineer, Engineering
ROY, Dave ..... Lab Technician
WHITTAKER, Harry ..... Head, Engineering

pollution measurement

BRADT, Paul ..... Technologist, NAPS Network Operations
BRUNET, Paul ..... Head, Ambient Measurement
CIANCIARELLI, Dominic ..... Supervisor, Source Testing
D'ADDARIO, Frank ..... Technologist, QA & CSM
DANN, Tom ..... Head, Air Toxics
FEWSTER, Janet ..... Secretary
GILBERT, Clem ..... Technologist, NAPS Network Operations
HODGSON, Ross ..... Project Engineer, Measurement Technology
LEUNG, P.K. ..... Head, Source Measurement
LIMOGES, Ray ..... Technologist, QA & CSM
MAR, Jim ..... Supervisor, Measurement Technology
MEADOWS, Al ..... Technologist, Source Testing
RIGDEN, Ian ..... Technologist, Source Testing
SHELTON, John ..... Supervisor, NAPS Data Publications
STEENKAMER, Adrian ..... Chemist, Measurement Technology
WANG, Daniel ..... Project Scientist, Air Toxics
WILLIAMS, Brian ..... Supervisor, QA & CSM
WILLIAMS, Don ..... Chief
YEATMAN, Rick ..... Technologist, NAPS Data Publications

vehicle emissions testing laboratory

BARTON, Peter ..... Program Engineer
BREALEY, George ..... Calibration Technician
CORKE, Doug ..... Test Technician
EDWARDS, Elisabeth ..... Secretary
FEARN, Jim ..... Project Engineer
GREER, Allan ..... Chemical Technologist
HENDREN, Fred ..... Chief
HOWES, Peter ..... Chemical Technologist
KOT, Jim ..... Project Technologist
McCASKILL, Clayton ..... Test Technician
McASKILL, Ron ..... Head, Vehicle Section
MOODIE, Ron ..... Test Technician
POIRIER, Gaetan ..... Vehicle Technician
PRYCE, Kesort ..... Vehicle Processing Technician
RIDEOUT, Greg ..... Program Engineer
ROSTKOWSKI, Jacek ..... Head, Testing/Quality Control Section
SOULIGNY, Michel ..... Senior Calibration Technologist
THOMPSON, Chalie ..... Test Technician